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VETERINARY MEDICINE

SEPTEMBER 1938

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No. 9

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The speed of travel of spermatozoa in the genital tract of the ewe was 12.4mm per minute, as contrasted with 4.83mm per minute *in vitro*.—Mass. Sta. Bul. No. 339.

Where poisonous plants are known to infest pastures, it is always advisable to give imported animals a feed of good quality hay before turning them on their new range. Then they should be permitted to range for but a short time, and be herded away from ground known to be dangerous.

The evidence indicates that fowl leucosis is an infectious disease, and the transmissible agent is a filterable virus. The clinical course is variable, extending over a period of weeks or months in some cases, while in others it is comparatively short. No complete recoveries occur, although temporary respites from the disease have been noted.—*Jour. Amer. Vet. Med. Assoc.*, 1937.

Bacteria other than streptococci that may be present in the udder and therefore present in the milk sample do not greatly interfere with the accuracy of the microscopic test for streptococcic mastitis, since the reproduction of the streptococci is only slightly reduced in their presence.—*Amer. Jour. Publ. Health*, 1937.

Engles and Stein have taken out a patent for Merck & Co., on bismuth allantoinate for the treatment of indolent wounds.

Among certain experimental pullets the highest mortality rate has been sustained in the group with the highest production record. This does not correspond with announced and published reports of many flocks wherein it has frequently been reported that the low production and high mortality went hand in hand.

Numerous spontaneous outbreaks of coryza and bronchitis in young chicks have on some occasions originated from the same hatchery, suggesting the possibility of infection at the time or shortly after hatching. Careful cleaning and disinfection of the hatchery and disposal of recovered chicks, checks the spread of the disease.

Anti-hog cholera vaccination is apparently—but only apparently—a simple procedure. Repeated disastrous results have not served to change the erroneous belief which has developed from statements of those manufacturers of biologics which sell their products directly to the farmer without regard for his qualification to use them safely.—*L. A. County L. S. Dept.*

Leucemia (Erythroleucosis) of Canaries*

By A. J. DURANT and H. C. McDOUGLE,
Veterinary Department, University of Missouri

The canary business is world wide. There are large numbers of these birds in the United States today. Although they are a very small bird, their monetary value runs into the hundreds of thousands of dollars. It is not uncommon for individual singers to sell as high as $25.00. The price for male canaries is rarely below $3.75. The females sell for somewhat less.

Recently this department untertook the investigation of diseases of canaries, partly because but little work of a scientific nature has yet been done in this field; and because certain canary journals have requested our assistance in the control of destructive diseases now prevalent among these birds.

Naturally any discovery relating to canary diseases and their control would be of great value to the industry. We are happy to report that considerable progress has already been made in our researches, although the work was begun only recently.

Early in 1938 a bird that had been ill for some time was received from western Missouri. It was kept under observation until it died. A post-mortem examination revealed that the bird had a greatly enlarged liver and slightly enlarged spleen. Post-mortem changes had taken place prior to the examination; this precluded blood studies, which unfortunately were not made while the bird was alive. Though leucemia was suspected, a definite diagnosis was not made.

A short time after the death of this bird two more birds were received from the same owner, who reported that several females had died of the same trouble and that the two sent to our laboratory were showing signs of illness. It was believed by the owner that the birds were affected with "egg bound". One of them had been affected for two months.

It was decided to make an exploratory laparotomy, using nembutal as an anesthetic. The use of nembutal for canaries is the same as for large animals; that is, 1cc to each 5 pounds of body weight. Because of the small size of the canary (19-24 grams), however, it is necessary to dilute the nembutal by measuring out 0.04cc of nembutal solution, then adding 0.36cc of sterile water. One-tenth of this diluted nembutal to a 24-gram bird produces approximately complete anethesia. However, in some cases the amount has to be varied a little, depending on the size and the condition of the bird. The anesthetic is injected subcutaneously. Injections are made with

Figure 1. The liver and spleen on the left are from a canary affected with leucemia (erythroleucosis). The liver and spleen on the right for comparison are from a bird the same size but healthy.

The scale of inches at the bottom of the photograph will help to visualize the actual size of the organs. The weight of the diseased liver was 3.2 grams as compared to the normal liver of 0.8 grams. The diseased spleen weighed 0.4 grams whereas the normal spleen weighed only 0.1 gram. Notice also the mottled appearance of the two diseased organs as compared to the healthy ones. This mottling is characteristic of leucemia of these two organs.

*Contribution from the Department of Veterinary Science, Missouri Agricultural Experiment Station. Journal Series No. 572.

a 1cc, all-glass tuberculin syringe and a 27 gauge needle.

A good method of restraint is to fasten the wings by means of small thumb tacks through the wing feathers. The legs are restrained by a fine thread attached to thumb tacks.

The bird showing the least enlargement of the abdomen was selected for the operation. The abdominal wall was opened by a medial line incision. The intestines were carefully removed and examination made of the abdominal cavity. The bird was found to be suffering from prolapse of the abdomen. The intestines were carefully replaced and the abdominal wall closed with a continuous suture. By making deep sutures in the abdominal wall the prolapse was corrected, and the bird seemed to feel little effect from the operation after the third day.

The operation on the other bird, which was showing marked enlargement of the abdomen, told a different story. The abdominal wall of the canary is very thin and delicate, and though very small instruments which are used for eye operations in humans were used to open the wall of the abdomen a severe hemorrhage occurred. This was due to the fact that in incising the abdominal wall the scalpel penetrated into the liver. The liver was so enlarged that it occupied practically all the abdominal cavity and had pushed other organs aside. The spleen was correspondingly enlarged, as shown by Figure 1. While the bird was still under the anesthetic blood smears were obtained and microscopic examination of the blood was made (Figure 3). This revealed that the bird was suffering from the erythro type of leucosis, and confirmed previous suspicion of leucosis in the first case mentioned in which the enlarged liver had been observed. An attempt was made to inoculate two other canaries with some of the blood of this bird to determine whether or not it was a transmissible form of leucosis.

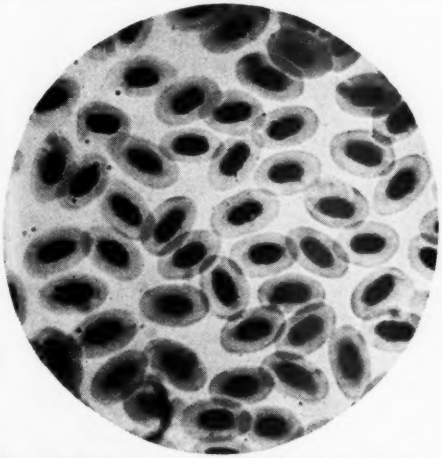

Figure 2. Photo-micrograph of the blood of a healthy canary.

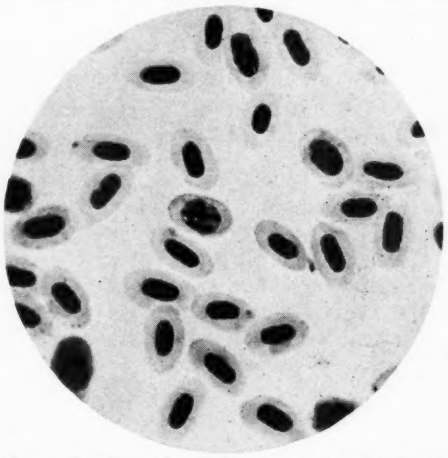

Figure 3. Photo-micrograph of the blood of the canary affected with leucemia. Note the decrease in red cells and the increase in the number of young erythrocytes in the blood as compared to the blood of the healthy canary.

The bird under anesthesia was given an additional amount of nembutal to cause its death and the liver and spleen were removed for further study. Liver and spleen emulsion were used to inject two healthy canaries, but in both cases the birds died as a result of the injection.

It will be necessary then to depend upon the discovery of other cases of this disease for further investigations. Since this is the first definite diagnosis of erythroleucosis or any form of leucemia in canaries it is naturally of great interest and further work

(*Concluded on page 420*)

Equine Impaction

By E. T. BAKER,
Moscow, Idaho

AFTER having treated nearly 100 cases of equine impaction with lentin and Lang's solution, in conjunction with other drugs, and having been in written and oral communication with many successful practitioners, we have come to the conclusion that lentin and Lang's solution have a useful place in equine practice, but they must be used with care. The patient must be treated prior to giving these preparations, or some very embarrassing moments are prone to occur.

Unfortunately, we treated several rather easy cases of equine impaction with lentin. The horses were young and vigorous, and the drug acted beautifully. In about 45 minutes there was a copious bowel movement, with several large impacted masses. The owners were delighted.

"Doc, you sure got somethin' there," was the general expression of the by-standers.

We, too, began to have dreams of another calcium gluconate parade of spectacular recoveries. We threw out our chest, just as if we had bowled a score of 265 in a match game, and the world seemed much brighter.

HOWEVER, this fool's paradise came to a sudden and abrupt ending. Our first really bad cases began to come up after harvest last year, and the very best mare we had treated in many months happened to be the victim. After a rectal injection of soapy water and glycerin, we gave her a Reek's capsule, and then a "shot" of lentin. Fortunately, the owner realized the animal was in bad shape, but when she began to sweat and slobber and a peculiar, glaze-like look came into her eyes, we suggested leading her out back of the barn toward a gulch, where the digging would be rather soft. She died in less than 20 minutes after the lentin was administered. Post mortem examination revealed three large impacted masses in the colon, about 20 feet from the rectum. The cecum was full of soft, fermenting material, and quite congested. The owner's comment when he saw the "clogs" in the colon was:

"Take a half a stick of dynamite to move them compactions."

Driving back home some 20 miles over the mountains, we tried to review the case from a cold-blooded viewpoint. Suppose that had been our animal, would we have treated it the same way? What was wrong? Was the mare too far gone when we were called, or was the treatment too drastic? It looked very much like the treatment was all right but the method faulty.

OUR next case was an old mare, about 18 years of age, and in poor condition, due to bad teeth, unbalanced diet, and, probably, worms.

Here, we thought, would be a good place to try Lang's solution. The mare was quiet, and an intravenous injection would not be hard to give. (When an animal is trying to tear the barn down, this form of medication is far easier to talk about than to administer.)

Giving the venerable dam a Reek's capsule, with a colic mixture to keep down bloat, we slowly administered the bottle of Lang's solution in a very scientific and skillful manner, according to the hired man.

In about 15 minutes she began to slobber copiously, and we let her have a bucket of water with the chill taken off. Then she began to tremble, and become very restless. Still, we thought that was only natural. But when she began to sweat over the belly, and that peculiar look came into her eyes, and her lower lip sagged down, we felt about as optimistic as a candidate running for Congress on the Republican ticket in Georgia. Again we opened the barn door, and the mare trotted out to a straw pile near by, where she rolled violently a few minutes, shuddered, stiffened out, and lay still.

Again, as we drove home, we "figgered" something was radically wrong with our line of treatment. It reminded us of the

days when barium chloride, injected intravenously, held a vogue, about 25 years ago, followed by large doses of arecoline, and then eserine and pilocarpine.

Other practitioners we talked to had the same experiences. Then, last winter, when we were assembling material for the special equine practice issue of VETERINARY MEDICINE, articles dealing with this condition began to come in.

PROFITING by these suggestions, we began to treat impactions more leisurely, if we may use that term, directing the first efforts toward relieving the intense pain, and checking the formation of gas. In bad cases, we used a cecal trocar with good results, for, when the bowels become so "jammed" in the abdominal cavity, and full of gas, they cannot even begin to move. It is much like performing embryotomy on a dead fetus prior to performing some good old-fashioned "pullin'."

Our worst types of forage bringing on impaction in the horse in this country are cheat grass, pepper grass, Chinese lettuce, and old sweet clover. These form masses much like a large twisted rope, which are sometimes several feet in length, weighing up to 50 pounds. One straw impaction, examined post mortem a few years ago, was 56 inches long, and weighed over 70 pounds. In other words, we get real cases with which to deal. These animals may be out on pasture, without any grain, and they continue to eat until they die.

We still lose cases of impaction, but we do not kill them by too hasty or drastic treatment. Here is our present method, which, of course, varies from case to case, as circumstances warrant:

We make a careful examination, and get a history of the case, which can be believed about 50% of the time, and determine what type of treatment is indicated.

We may give a Reek's capsule, and an aloin bolus, with another capsule of colic medicine, if it seems desirable to relieve the pain. If the animal is much bloated, we do not hesitate to use the trocar, with plenty of iodine and ether on the site of puncture. One can use the stomach pump, if desirable, but most of these cases are too far back for much medication to take effect.

We leave a quantity of oil, in which a pint of our bovine laxative is mixed, and two grains of strychnine or an ounce of fluid extract of nux vomica.

This bovine laxative is made up as follows: Into a ten-quart enameled (do not use aluminum) pail pour five pounds sodium hyposulphite (common hypo) and two pounds sodium chloride. Pour over these salts a gallon boiling water, and stir well. Now add one five-pound pail of dark corn sirup; one-half ounce soluble saccharine, and one pint fluid extract aromatic cascara. Stir well, and fill the bucket up with hot water.

This mixture seems to check fermentation, and is a slow, but steady laxative. We use this and mineral oil, about half and half. For large horses, one quart of the mixture can be given three times a day; for smaller ones, a pint is enough. This keeps the owner and his brother-in-law busy, and when the patient recovers, they say:

"Well, Doc, me and you sure saved that critter."

This is what might be called rural coöperation.

After the patient has been treated for about 24 to 36 hours with this mixture of a physic, bolus, stimulants, oils, and antiferments, and no impacted masses have been presented to a waiting world, we then feel it is time to use either lentin or Lang's solution. If the animal is restless and vicious, we content ourselves with giving lentin between jumps. If the animal is more quiet and amenable to an intravenous injection, we give the Lang's solution.

In from 30 minutes to an hour and a half, we usually see a very copious bowel movement, with immediate relief of the patient and owner.

IN other words, these two treatments give the necessary impetus to the intestine, after the mass has been moistened or loosened by the preliminary treatment.

We tell the owner on our first trip to call us if results are not obtained within

24 to 30 hours. The added expense of a second trip is soon forgotten when the owner hitches up his animal, now fully recovered from what he thought was a fatal illness.

This line of medication is not perfect, by a long shot. But it is a step forward, and results are what we live on. We are always glad to hear from other practitioners, whether they agree with us or not.

Infectious Calf Pneumonia

The cause of this serious disease of young calves is said to be a bipolar bacterium closely related to the hemorrhagic septicemia group of organisms. The infection spreads slowly at first and increases rapidly, unless preventive measures are taken early in the development of the disease.

The younger the calves, the more readily are they infected and the greater the mortality, especially when a large number are housed together.

The infection is supposed to be contracted by both ingestion and inhalation. Although very young calves are most susceptible, later on in some herds, it seems that the virulence of the micro-organisms becomes exalted. It then infects calves from four to even six months of age.

The disease will develop in home-bred calves, but is found more often in calf herds that have passed through public stock yards on community sales or in calves shipped in dirty, infected stock cars or trucks. Infection may result from infected litter shoveled out of trucks at the side of roads or into ravines, where it washes down over pastures during a rainy season.

The symptoms are usually constant and should not be confused with ordinary pneumonia. There is a rise of temperature to 102° to 104°F. the first few days, or at least for the first 24 hours, followed by a slowly falling temperature as the disease progresses. It frequently falls below normal long before death. Loss of appetite supervenes early, and as the calf will take little or no food, emaciation progresses rapidly with the progress of the disease. A short, husky, hacking cough, labored breathing, extreme weakness and a lack of thirst characterize infectious calf pneumonia. The course is usually rapid, resulting fatally in a high percentage of untreated cases in from 48 hours to six or seven days. In a few sick calves, it may become chronic, but many such calves die at the end of the course if they are not treated.

The untreated calves that do survive have a lessened available lung capacity and are frequently so badly stunted, that some never grow and develop normally into good milk cows.

Post mortem lesions are those of acute pneumonia. Much of the pulmonary tissue is usually transformed into a dirty gray or blackish, heavy mass. Profuse pulmonary edema and frequently much edematous fluid is present. In extreme cases that have lived for a number of days, gangrenous patches in different stages of development will be observed. Some of the more extreme chronic cases may also show multiple pulmonary abscesses. Diagnosis can best be made or confirmed by autopsy.

Treatments of many different kinds have been recommended, but none seem to have any virtue, except possibly a few that are used in conjunction with vaccination. Immunization is the only satisfactory preventive. It is very effective. Treatment of the sick calves consists of vaccination with a 3 to 5cc dose of pneumonia mixed bacterin bovine, and repeat it every three to five days as needed. Hydrated lime or sodium bicarbonate, ½ pound to 100 gallons, should be supplied for drinking water.

All healthy calves in the herd should receive two doses of vaccine; the sick ones as many doses as needed, but not too frequently. Nursing and care consisting of good clean bedding daily, plenty of sunshine, plenty of heat, prevention of drafts, all go a long way toward improving the chances of recovery.

A general clean-up and disinfection of the premises is in order. Dry lime should not be used, as the dust excites much coughing and irritates the mucous membranes of the lungs, lessening the chances of recovery of the sick calves.

S. L. STEWART.

Olathe, Kans.

Legal Problems in the Disposal of Unclaimed Animals

By W. F. HARLTON, JR.,
Detroit, Michigan

WHAT would you do? Let's suppose that you have received a dog in your Veterinary Hospital to board for three weeks. The well-dressed stranger who left it paid in advance, mentioning that he was leaving for California on a short vacation. The three weeks have passed. After another week of waiting, you begin to wonder. You look at the mixed-breed animal; it does seem rather intelligent. However, it costs money to board a dog, so you write the owner, but receive no reply. Or perhaps your letter is returned unopened. Immediately there flashes through your mind the possibility that the man was just "getting rid of the dog". You know that sooner or later, you too must get rid of this star boarder. But when, and how?

I know as a practical matter, that, after two or three weeks of non-payment, your choice would be one of the following: (1) Destroy the animal; (2) Give it away; (3) Sell it for a nominal amount; (4) Keep the dog indefinitely; or (5) Hold a public auction sale. And, no matter what you did, you would then forget the whole transaction. But let's assume that this is a case in a thousand. The owner started for California, was injured in an automobile wreck, did not receive your letter, and returned after a few months to claim the animal. Finally he brings suit claiming $2,000 damages for the loss of the dog, which he alleges was specially trained for a vaudeville act. Now what would you say?

"Improbable?" Perhaps, but you never can tell! Similar cases are on record. Lawyers have a gloomy way of looking at life. They can think of more dire possibilities than ten accident insurance salesmen, but still they can't forecast them all. If one were to read through the decisions handed down by the courts every day, one would be amazed at the improbable things which can and do happen. Proprietors of small animal hospitals have found that clients are often unreasonable. By experience they know they must have an answer for the troublemakers who are always suing somebody. Further, they are confronted with variations of this basic problem almost every day. Knowing that an unclaimed animal must be disposed of, they have speculated many times just what they could do to prevent the owner from trying to make trouble later. However, let's not misunderstand each other at the outset. Because there are 48 states and the District of Columbia in this country, with each jurisdiction taking a little different slant on the law, there is no universal, sure-fire, legal formula to relieve the veterinarian of liability. In place of that, I merely want to discuss the legal problems involved so that each individual may best work out a solution in his particular jurisdiction. We'll start with a few fundamentals, and work toward a solution as we go along.

IT has always been the law that when one man places his property into the hands of another, each man assumes certain duties and obligations. If the one who receives the property is paid for safeguarding it, he is held to the very highest standard of care in protecting that property. If he violates that standard and carelessly or wilfully permits harm to come to the property, the law says that he must pay for the loss. That sounds fair enough, and is in brief the "common law", or law in the absence of any statute to the contrary. If the state legislature decides that it does not like the "common law", then it may enact a statute to change it. Such statute may make any change so long as it remains within the limitations provided for by the state and federal constitutions. In addition, the two parties to the transaction may make a special agreement between themselves. We will consider each of these in turn: first, the common law view, second, some statutory law, and third, special agreements.

Now, if anyone was managing a cat and dog infirmary way back in Ye Merrie England before Columbus discovered America, he certainly had nothing to worry about. No legal action for injuring or stealing a dog was then permitted. The "common law" recognized a dog neither as a wild nor as a domestic animal. It simply denied that a dog was property at all. The reasons given were that: (1) the dog did not serve as food, nor was it a beast of burden, (2) the dog was subject to an incurable disease (probably rabies) which if not destroyed, it would communicate to mankind, and (3) although some dogs were good companions, being intelligent, watchful, and affectionate, others were public nuisances because of their ferocity and mischievousness. Some of the early judges made an exception in the case of mastiffs, hounds, spaniels, and tumblers.

The recognition of cats as property was even more curious. In early Britain, cats were regarded as guardians of the King's granary, and hence of great intrinsic value. If one killed a cat, he paid the owner damages measured as follows: The cat was suspended by the tip of its tail with its nose just touching the floor. Grain was poured over it until the whole cat was covered. The owner was then entitled to this amount of grain for the loss of his cat. Later, the cat was simply classed with a dog, having no property value, and not subject to legal action.

Such is not the case today, however! The dog is now generally recognized as property in every jurisdiction by common law or by statute. The change in the nature of the animal has made it a chattel of value. The state has recognized this property value by levying a tax upon the dog. As to cats, the situation is not quite the same. In the most recent decision, an Oklahoma court in 1924 said that although the owner of a cat may sue for recovery of it, or damages inflicted upon it, that one who steals a cat still cannot be held for larceny. This would seem to indicate that even today there is still only a qualified property interest in cats.

BUT, getting back to an unclaimed animal in a hospital, probably the most obvious remedy for payment is to hire a lawyer, sue the owner of the animal, get a judgment, and levy the judgment upon what property of the defendant can be found, including the animal itself. But, how long should one wait before starting suit? Should one keep the animal for several years to make a lawsuit worthwhile, then include those years of board in the damages; or should suit be started the day after the advance payment expires? At best, this is a cumbersome and costly method; since we are interested in quicker and more direct methods for the disposal of the animal itself, we shall eliminate the direct lawsuit remedy without further consideration.

Many persons have vaguely in the back of their minds the idea that possession of the animal gives some special privilege in disposing of it to defray the hospital bill. We call this idea a sort of qualified property interest in the animal itself, or for short a "lien". If we depend upon the "common law", we find that it offers very little solution for our problem. A "common law lien" is simply the right to hang onto a thing until the bill is paid. If at any time, the creditor relents and loses possession of the property, then the lien is gone. The "common law lien" further does not arise unless the courts can find that the claimant has added something of value to the property. Thus, by "common law" a mechanic or artisan was granted a lien for his labor. And the "lien" has been further extended to innkeepers as to guests' luggage, and to warehousemen. But there it stopped. It has been well settled under the "common law" that one who feeds or cares for the animal of another has no lien on it for his charges. Thus, liverymen and agistors were denied a lien since they did not impart additional value to the animal. (An agistor is one who takes horses or cattle to pasture for hire.) However, there are a few early decisions which recognized a "common law lien" in favor of farriers in the doctoring and curing of animals. Such lien was, however,

refused where the services were only incidental.[1]

Thus, to summarize the "common law", a veterinarian is probably entitled to retain possession of all animals which he treats until he is paid; but he is not entitled to hold boarders whether they are paid for or not. The "common law" gives him no right to sell or to dispose of any property placed in his hands, until the owners of that property direct him to do so. In the event that he inadvertently did happen to dispose of an unclaimed animal, he might argue: (1) That he gained ownership of the animal because it was abandoned by its owner, or (2) That he gained ownership by adverse possession. Both the doctrine of "abandonment" and of "adverse possession" are so hedged by technical limitations and are so frowned upon by the courts, that they should not be relied on except as a bluff.[2]

ONE might argue that the state legislatures have enacted a large number of laws from time to time, and that there surely must be some provisions in them which will afford greater protection. To this the answer is simply "yes" or "no", depending upon the particular state. I can only cite a few samples of state statutes to give an idea how they vary.

Alabama Civil Code 1928

Chap. 314, Sec. 8890-8892. — The only possible applicable statute found, gives a lien to those pasturing horses, livery stable keepers, and "other places for feeding and caring for stock for pay." Are dogs and cats "stock"? Probably not, but maybe! The statute further provides that if no payment has been made for 10 days, then an additional 10-day notice must be given by advertising once a week for two weeks in the local paper; then a notice should be posted in three conspicuous places. If the owner still fails to pay, then the creditor has the right to sell the animal.

California Civil Code 1937

Sec. 3051, 3051a, 3052 provides a lien to veterinary proprietors and veterinary surgeons dependent on possession for the caring for, boarding, feeding, and medical treatment of animals. If the claim is going to be over $100, a notice in writing should be sent the owner before starting the work. If the amount due is not paid within 10 days, the veterinarian may by advertising in the local newspaper sell the animal at public sale after an additional 10 days have elapsed. If there is no local newspaper, then notice may be given by posting such notice in three different places in the town for 10 days.

Illinois Revised Statutes 1937

Chap. 82, Sec. 59 and *Chap. 141, Sec. 3* provides that "Agisters and persons keeping, yarding, feeding, or pasturing domestic animals shall have a lien upon the animals——." To foreclose the lien, a 10-day notice in writing must be given the owner, or if the residence of the owner is unknown then an affidavit may be filed with the County Clerk; or a notice of the sale may be published once a week for three weeks in the local newspaper. The statute fails to designate whether the sale shall be private or auction sale.

Maryland Statutes 1933

Chap. 474, 476, 507.—No statute was found applicable to dogs and cats. The statute, however, does give a lien to livery stables, and to those "keeping any horse, mare, gelding, mule, or horned cattle." To foreclose such lien requires sale at public auction after 10 days' notice in one newspaper, and distribution of handbills.

Michigan Compiled Laws 1929

Sec. 9014-9025.—"Unclaimed property." *"Whenever any personal prop.rty shall be* consigned to, or *deposited with any* forwarding merchant, wharf keeper, warehouse keeper, tavern keeper, or *keeper of any depot for the reception anl storage of* trunks, baggage, and other *personal property,* such consignee or bailee shall immediately cause to be entered in a book . . . a description of such property with date of reception thereof." The owner must further be notified by letter. If he fails to claim his property within three months, then a notice must be published in a newspaper once a week for four weeks. Then after a three-month wait after publication of the first notice, an affidavit must be delivered to the Justice of the Peace. The constable then must take a 10-day notice and post it for 10 days in three public places. Then a public auction sale may be held, and an affidavit of the results filed with the county treasurer. Apparently this was intended to help out railroads and warehouses, but if you read only the words I have underlined it would seem to include veterinary hospitals also. However, even so, it doesn't do them much good!

Sec. 13186.—Mechanics' Liens. "Wherever any person shall deliver . . . to any person any horse,

[1] While this is theoretically sound law, we cannot be sure that the courts today would necessarily follow this rule. These are the only decisions found which might support it: Lord v. Jones, 24 Maine 439; Miller v. Marston, 35 Maine 153; Danforth v. Pratt, 42 Maine 50; Allen v. Ham, 63 Maine 532; Hoover v. Epler, 52 Pennsylvania 522; Maryville Nat. Bk. v. Snyder, 85 Missouri Appeal 82 and Brenan v. Currint, Say 224, 96 Reprint 850 (England).

[2] "Abandonment" of property gives ownership to the one acquiring it, if he can prove some clear, unequivocal, and decisive outward act and intention on the part of the previous owner to abandon. Non-demand, non-use, and lapse of time by themselves raise no presumption.

"Adverse Possession" will give ownership to the person who is in actual, open, notorious, continuous, exclusive, and hostile possession under a claim of right for the uninterrupted statutory period. The owner must be fully apprised that you are no longer holding the property for him, but for yourself.

mule, neat cattle, sheep, or swine to be kept or care for, such . . . person shall have a lien thereon for the just value of the labor and skill applied thereto by him, and for any materials which he may have furnished . . . and for keeping and care of such animals, and may retain possession of same until such charges are paid."

Sec. 13194 provides an additional lien for any expenses incurred as to property upon which a lien is already being enforced, when it consists of "horses, cattle, sheep, swine, *or other beasts.*" Note the words italicized in comparison to *Sec. 13186.* That section would not include cats or dogs. The language of this section would include any animal, but the section itself is useless unless there is already a preëxisting lien.

Sec. 13188 provides a method of collecting for the lien. If the property remains in the creditor's possession for nine months, then if a 30-day notice of sale is sent by registered letter to the owner of the property, a public sale can be held by the constable to defray expenses. (This wouldn't help a small animal hospital much!)

New York Consolidated Laws

Chap. 33, Art. 8. Sec. 183 provides that a person pasturing or boarding one or more animals has a lien dependent upon the possession of each animal until paid.

Sec. 180 provides that any person who makes, alters, repairs, or in any way enhances the value of an article of personal property at the request of, or with the consent of the owner, has a lien on such article for his charges, for the work done, and materials furnished, and may retain possession thereof until such charges are paid. (These two sections would seem to include animal hospitals.)

Art. 9, Sec. 201, 202.—To foreclose the lien a notice must be served personally on the owner or by mail asking payment before a certain day at least 10 days after receipt of the notice. It further should state when these goods will be sold if no payment is made. Then a notice must be published once a week for two weeks after expiration of the notice by letter. If there is no newspaper locally then a notice must be posted for 10 days in six conspicuous places. Then a public auction sale may be held not less than 15 days after the first publication. (A rather cumbersome method, but not too bad if the sale by auction could be eliminated.)

Ohio General Code

Sec. 8353 and 8354 provide that one who feeds, or cares for a "horse, mare, foal, filly, gelding, cattle, sheep, swine, mule, or ass" may hold the animal for 10 days after no payment, then after giving the owner 10 days' notice as to the time and place, can sell the animal by public auction. (A quick solution, but it does not apply to cats and dogs.)

Pennsylvania Statutes

Chap. 27, Title 6, Sec. 11 and 12 provide that when any person has a common law lien on personal property for work done, he must send an itemized statement verified by oath of such work done. Then if no payment is made within 30 days, the creditor may sell the property after another 10-day notice. (A good statute for the animal hospital; but note that it turns upon the definition of a "common law lien".)

Chap. 4, Title 12, Sec. 2312, 2313 provides that the court may inquire into the regularity of such sale, and if it finds that it is irregular, fraudulent, or prejudicial, it may set such sale aside. (One must be careful in all jurisdictions that the sale is honest!)

IN reading over these excerpts, one is struck by the advantages of some provisions, and by the defects of others, as applied to our problem. These defects are of three general types:

1. In many statutes the language is either so limited or so ambiguous as to leave one in doubt concerning its applicability to dogs and cats.

2. The methods of disposal of the unclaimed property are cumbersome, slow, and costly. The drafters of such statutes had in mind goods of great value, or of relatively small storage expense. In this regard, dogs and cats are rather unique. While the value to their owners is largely sentimental, they have, on the whole, very little intrinsic value. The right to the veterinarian of re-sale is not nearly as important, as the right of destruction. Further, although the veterinarian may genuinely regret the disposal of his "star boarders", feeding and caring for them quickly becomes an expense he cannot afford to carry.

3. In seeking to comply with any statute, one must be very careful to follow the language of it exactly. Any deviation from its precise routine will void the whole transaction. In this regard, one must interpret the meaning of its words and phrases. If the language is vague, and one is left in doubt just what to do, one acts at one's own peril. Incorrect interpretation may prove costly! Thus, if a statute directs the sale of an animal, does that mean it is to be sold by private sale, or by public auction? at any price, or to the highest bidder? Suppose a public auction is held, and no one comes to buy. May the veterinarian purchase the animal himself, or must he hold another sale? Is the right to sell worth all the time, trouble, and expense involved?

THE question may be raised about the signs in hospitals reading "not responsible for animals left over 30 days", and about the claim receipts given to clients with similar numerous rules and regulations printed thereon. I can only reply that I am thinking of putting a sign on the radiator of my car reading "not responsible for collisions in which I am involved!" The answer is, of course, that if a duty is imposed by law, a mere sign will not abrogate it. As we have seen, the very act of taking an animal into the hospital for pay imposes a very high duty upon the proprietor to take care of that animal. This duty cannot be entirely escaped, but it may be limited. The formula is very simple. The owner of the animal and the veterinarian *merely agree to certain conditions and limitations* before the latter consents to take the animal in. This mutual agreement constitutes a contract between the two.

As simple as that may sound, every such attempted contract must run a gantlet of legal tests. It is essential that both parties agree to the same things. It may be routine to have a number of conditions and regulations printed on the receipt given to the owner of an animal. Some of these may be in very fine print; others may be on the back of the receipt. A sign posted on the wall may contain other conditions. Except for the matter of proof, it doesn't make any difference where these conditions are stated or how, *just so long as the client agrees to them.* To be sure, the veterinarian should go over them one by one with him, explaining each as he proceeds. Anything less will raise a question as to whether the owner agreed or not. Mere silence does not mean agreement. If one makes certain statements, and the client does not reply, there is no presumption that he has either agreed or disagreed. Likewise, because a condition is printed on a sign or on a receipt to which the client fails to object, that is no proof that he agreed to it. Further, one should not wait until the day after the animal is left to make all the arrangements; this should be done in advance.

But, even assuming that the client agrees to whatever terms the owner of the hospital may dictate, there are still limitations. The person who tries to exempt himself from too much responsibility may find that by so doing he has voided the whole contract. The courts have traditionally frowned upon any attempts to limit liability by contract. In scrutinizing a given contract they apply a curious rubber yardstick called "public policy". This vague concept is merely a test to determine whether the public as a whole will be harmed if such contracts are declared lawful. The courts are in a sense protectors of those who are unable to take care of themselves. Thus, one must be sure that the limitations imposed are reasonable. The courts construe the language of any contract very strictly against the person who dictates it; also, they construe such language very, very strictly against the person who is attempting to limit his legal duties by contract.[3]

Although it should theoretically be possible to solve the problem satisfactorily by this agreement method, the difficulties have been too great for others who have tried it. Since they started in business, this same problem has been plaguing hotels, railroads, shipping lines, warehouses, jewelry stores, pawnshops, livery stables, animal agistors, and garages. At the outset, all of them attempted to relieve the pressure of liability by drawing up contracts with "reasonable limitations." Finally, in nearly every jurisdiction, they have persuaded the legislature to enact a statute which specifically sets forth their duties and obligations. In every case, some arrangement is made for the

[3] Here are some attempts to limit liability by signs and by printed conditions which failed:

A Colorado check room posted a sign and also issued a printed claim check that it was not responsible for a sum over $25 in case of loss. The court held it was ineffective. Similar decisions: 27 A. L. R. 154, New Jersey, Missouri, New York, Mississippi. 7 A. L. R. 1229, Tennessee, and 37 A. L. R. 754, Montana.

A Connecticut garage receipt read "All property left at the owner's risk". A Texas garage sign reading "Not responsible for loss in case of fire or theft" was especially called to the owner's attention. An Ohio garage posted a sign "We are not responsible for loss to patrons by theft or fire." A notice posted in a Louisiana garage warned "Cars and contents stored at the owner's risk." 65 A. L. R. 432. In each case, the court refused such limitation, declaring it to be null and void. 15 A. L. R. 683, Oregon, similar result. An Oklahoma garage decision similar, 34 A. L. R. 162. Also, a California warehouse receipt was ignored although it stated that the warehouseman was not responsible for loss by fire. A similar attempt in Georgia was refused legal standing.

A Washington bank issued a contract for its safety deposit boxes which read that it assumed "no liability whatever for any loss or damage that may occur". This attempt was likewise repudiated by the court. 40 A. L. R. 854.

disposal of unclaimed goods. Now to govern their actions, they merely consult the words of the statute.

I SPOKE earlier of the intrinsic value of a cat or dog. Perhaps we are needlessly worried. Maybe if someone did sue us for the loss of his dog or cat, the amount which he could collect would be too trifling to worry about. Let's look at a few decisions to see how much a dog can be worth!

A Kentucky court held that an award of one cent damages wasn't enough for an excellent female hunting dog, testified to have been worth $250 to $500. In another case from the same state, a man who shot a dog was ordered to pay the owner the sum of $300 as damages. An Arkansas court made the following awards: $250 each for two dogs, $75 each for two hunting dogs, and $400 for a pregnant setter. In the last case, the lower court awarded $600, but the amount was reduced in the higher court. A Utah court gave the owner of a pure-bred cocker spaniel, nine months of age, a judgment of $125; while a New York court gave a judgment of $96.83 for an English mastiff eleven months of age. A federal court held that damages of $275 awarded against a constable for the shooting of a watchdog were not excessive. An Ontario court gave judgment of $125 for the death of a half-breed collie watch dog; while a Quebec court awarded $100 for injuries and $12 for veterinary services to the owner of an airedale terrier which had taken prizes. An English court awarded £25 for injuries to a greyhound whose tail had been run over by a wheelbarrow. The most recent case, decided in 1934 by a New Mexico court, awarded to the owner of a King Charles spaniel the sum of $150 when the dog died of strychnine poisoning from some laxative tablets prescribed by a druggist. The most sensational case was decided in California in 1931, when the appellate court decided that the lower court was too liberal when it gave the owner of a German Police dog, which had been working in the motion pictures, the sums of $10,000 actual damages and $25,000 punitive damages when the animal was shot.

In ascertaining the value of a dog, the courts have used a number of tests. Market value alone has been used in: Alabama, Arkansas, Georgia, Illinois, Iowa, Mississippi, Missouri, New York, and Texas. The original purchase price has been used in New York and Minnesota; while former offers of purchases have been shown in Arkansas, but refused in Alabama. The following states, where the market value cannot be shown, have permitted the showing of the actual value of the dog to its owner, allowing testimony as to the particular dog's traits, qualities, breed, pedigree, and services it may have rendered: Alabama, Illinois, Massachusetts, Michigan, Mississippi, Missouri, New Mexico, New York, Oregon, Pennsylvania, Tennessee, Texas, and Vermont. Proof as to prizes and ribbons which had been awarded the dog was permitted in an Arkansas case. The mere sentimental value of the dog to its owner has been refused in New Mexico, New York, Texas, and Missouri. A Tennessee court permitted the owner of a pedigreed dog to show that the dog's value had been increased 100% because it had survived an attack of distemper, and therefore was immune to the disease. A state statute in Louisiana fixes the value of a dog which has been killed as that value declared by its owner at the last property assessment. But an Arkansas court has held that the mere fact that a dog was not assessed at all does not negative its value completely; nor does non-payment of the dog tax prohibit recovery in Alabama.

TO summarize, I think one can be safe in accepting the following broad conclusions: (1) That the veterinarian cannot expect much protection from the "common law", the most upon which he can rely being the right to hold the animal until paid. (2) That the various statutes are on the whole unsatisfactory to the veterinarian. The right to sell an animal after a long period of time by public auction, with all the attendant formalities, is not very valuable to a small animal hospital. Probably no statute or law gives the veterinarian the right to destroy the animal summarily.

(3) That the veterinarian may protect himself somewhat by agreement in advance, if he is careful that the owner understands and agrees to certain conditions, if the agreement is "reasonable", and if it is not "void as contrary to public policy". (4) That, although the average dog has little intrinsic value when it comes to re-sale, yet the value to its owner may be very great, and that value has been recognized by courts which have awarded sizable judgments.

One easy method out of this confusion is to pass it on to an insurance company by paying yearly premiums. A simpler (but risky) method is to take a chance that nothing will ever happen. I would suggest, however, as a more far-reaching solution, that each group of veterinarians, whether the state veterinary association or a local veterinary group, hire a competent attorney in its jurisdiction to ascertain the local legal situation, to apprise the members of their rights and duties under the statutes of that particular jurisdiction, and to draw up an "ideal" contract form which would be "reasonable" in accordance with the decisions of that jurisdiction. The attorney might also suggest changes to be made in the statutory law if the group in question is so situated that it would have a reasonable chance of having such legislation enacted.

Varied Medicinal Uses of Sodium Hyposulphite

One of, to me, the most useful drugs used in general practice, especially with large animals, is sodium hyposulphite combined with other agents as may be indicated in each case.

I commenced to use sodium hyposulphite in large doses five years ago, and the following are typical of the results:

Case No. 1.—A farmer returning from town in the evening found that his horses had broken open a wheat bin and eaten all they wanted. Two horses were beginning to show uneasiness, so he telephoned me to come out. Each of his five horses received 12 ounces, with a second dose of four ounces one hour afterward. One dram of nux vomica was added to each dose. These horses did not get sick. A two-year old colt forgotten and left outside was dead next morning.

Case No. 2.—A farmer ten miles out had a 1400-pound gelding suffering from acute indigestion and bloated so badly it could hardly breathe. I drove out as quickly as possible and found the animal lying on its side; I thought it was dead. I plunged my trocar into his flank and got very little gas; tried again in a different direction and got a little more. I knew then it was a gastric inflation. I administered one pound of sodium hyposulphite and three grains of methylene blue at once. With some difficulty we got the animal on its feet. Within two hours this horse received an additional two pounds of sodium hyposulphite with methylene blue, and was given some active exercise. There was complete recovery.

During the last five years I have treated hundreds of horses that have gorged themselves with wheat or barley, each receiving one pound of the sodium hyposulphite and five grains of methylene blue C. P. and one or two drams of fluid extract of nux vomica. Where this treatment is used early there are very few casualties. I advise giving large quantities of water.

Acting under the assumption that a large majority of the colics are due to irritation, stasis, and fermentation, I use sodium hyposulphite as a basis for all my colic treatment, administering it by drench or through a stomach tube, combining it with nux vomica in impactions, and belladonna and aconite in cases where there is a rise of temperature and threatened inflammatory action. As evacuants, arecoline, mineral oil, and rectal injections are used as indicated.

Another disease in which I have found sodium hyposulphite useful is equine encephalomyelitis. In the midst of an extensive outbreak of this disease here last August we could not procure serum and I tried a number of agents, eventually using sodium hyposulphite, six drams, methylene blue (medicinal), 30 grains, glucose, one ounce dissolved in eight ounces of hot sterile water, then strained. This was injected intravenously at one dose; sometimes a second dose was given one or two days afterwards. My losses were 50% under serum treatment, but dropped to about 15% under this treatment.

The foregoing are only a few of the uses of this valuable salt of sodium. Every day presents new indications for it.

T. V. Simpson
Yorkton, Sask., Can.

Bicornual Pregnancy of the Mare*

By DR. GEORG LICHTENSTERN,
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In the following discussion two cases of delivery are described which, on account of the complicated technique of embryotomy, must be considered among the more difficult cases in equine obstetrics. They may serve as guidance for the correction of similar positions skillfully, profitably, and quickly, by means of expedient reposition, appropriate measures, and modern instruments.

In his textbook on obstetrics Williams gives instructions applicable to those cases in which the extremities can be grasped, and for such simple cases the directions given may suffice. But when only one leg can be reached, or none at all, then the situation becomes more difficult. Such a presentation is shown in the accompanying illustration. In the case under consideration the length of the vaginal canal was 1.20 meter. Tht elbow joints of the fetus could barely be touched with the fingers during the examination. Because of circumstances not under control, an operation could not be performed, and the mare had to be sacrificed. The only gain was the educational value of the photographic reproduction of the uterus, disclosing the anatomical features. The picture warrants the claim to call the pregnancy bicornual. It discloses further why the elbow joints could barely be reached. Incidentally, a few weeks before I was called to this case, I had seen the mare on the street, and called the abnormality to the attention of the breeder, mentioning the possibility of a fatal termination. This circumstance is noted here merely because Williams, in the textbook quoted, says that these conditions usually remain unrecognized, and come to light only at the time of birth. With regard to the expulsive efforts incident to labor, they can be recognized as such, but they are peculiar and exhaust themselves visibly. Only the first phase of stimulation takes place, because the contractions originating in each apex uteri, counteract each other and consequently wear themselves out by neutralizing each other's action. Further, the reconciling feature of ample width of the external genital passages, otherwise present in equine obstetrics, is absent in these cases; greatest care is, therefore, needed in pulling the fetus through the peculiarly narrow vagina.

Case 1.—Rotated bicornual pregnancy (Anteflexio uteri, Jöhnk; compound bicornual pregnancy, Williams).

April 4, 1937, at seven o'clock in the evening I was called to see a four-year-old draft mare. At my arrival the mare was led into the yard. During the examination the animal exhibited a tendency to lie down; therefore, examination had to be carried out with the mare in motion. The pastern joint of the left anterior extremity had entered the vagina. The other leg, of which only the elbow joint could be felt, rested in a blind pouch.

Method of procedure: The mare was cast down on the barn floor, tied with cushioned straps over the pastern joint, and then, with block and tackle, raised to a position bringing the vagina on a level with the arm of the operator.

Phase 1: The left foreleg was cut off with the extractor (Pflanz model). It must be mentioned here that the bars of the instrument I use in my equine practice, have been reinforced. A covered knife (Malkmus model) was also used. The length of the vagina barely allowed me to reach the elbow joint with the fingers. This prevented the placing of a loop at this stage. Using a double hook (Krey-Schöttler model), I pulled the elbow joint nearer until a loop could be placed around it. The separation with the embryotome (Pflanz) took but a few minutes. It was placed in position in such a manner that the joint could be separated distally, in order to leave an attachment for the chain during extraction. The amputated limb was removed at once, because portions of the body which have been severed must be removed immediately, else injury to the uterus will result during the following delivery.

Phase 2: The head was beyond reach for palpation. The flexure of the neck could be felt, but it was as yet impossible to place a loop. The chain was now tied to the amputated limb, and the fetus pulled toward the pelvis until the loop could be pulled around the neck. This task was very tiresome and required 15 minutes to accomplish. Applying again the extractor, the head was severed from the neck readily. I refrained from the use of a wire saw purposely, because of the tiresome task of attaching the wire. Experience has taught me that the wire breaks easily. If the saw can be

* Translated by Fritz Volkmar, Chicago, Ill.

attached without difficulty, then the tearing of the wire is, perhaps, less annoying.

Phase 3: The obstetrical hook (Krey-Schöttler) was placed on the sternum; the obstetrical chain (Pflanz) on the amputated elbow joint. With the hand, the stump of the neck was guided into the birth canal.

Phase 4: The position of the mare was changed, allowing her to lie on the floor. The fetus was now pulled out, applying slow traction. The afterbirth appeared immediately. As the operation proceeded, the behavior of the mare did not differ from that of a mare foaling normally.

Total duration of the embryotomy, 1½ hours.

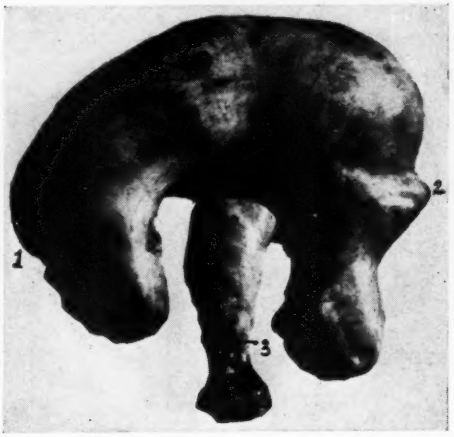
Case 2.—Simple form of bicornual pregnancy. The subject was a five-year-old half-breed mare. The owner showed me a mummified fetus, the size of a daschund, which the mare had aborted three hours previously. Exploration through the vagina disclosed the presence of a fetus in the left uterine horn, resting in frontal presentation with retracted head.

Both anterior limbs had to be severed, the extractor being used. In view of the narrow genital tract and the inferior position, it was inadvisable to use the embryotome; instead, a loop was placed around the neck. Traction was then applied to the neck until the head could be grasped by the lower jaw and brought into nose-end position; then the obstetrical hook was applied. During this operation the uterine horn, which had released the fetus, prolapsed. With every traction pull on the fetus the prolapse returned. In order to counteract the labor, the mare was made to move around, and the fetus was slowly developed by gradual traction from the walking animal. Following the extraction the prolapsed horn was repulsed. Since marked straining continued, the mare was kept exercised for six hours, after which the straining ceased. The mare appeared normal.

In mares which strain excessively I correct the position of the fetus while the mare is being led around, provided, of course, that the horse is sufficiently gentle to tolerate the manipulation.

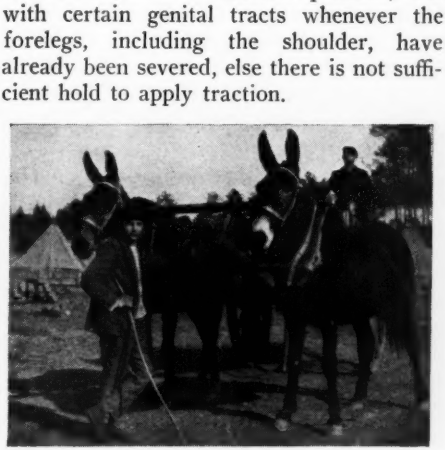
To correct the carpal flexion of the fetus first, and then to bring the head into nose-end position, is not considered to be in conformity with accepted practice. Always, the head position is to be corrected first, else there is danger of the head becoming displaced. In the case under consideration the head was already displaced sidewise, and could not be examined at all; thus, by necessity, the two anterior limbs had to be severed first.

Case 2 demonstrates clearly that both uterine horns may be pregnant simultaneously, and that a simple bicornual pregnancy may really exist. To my knowledge the complication of a prolapse of the uterus with bicornual pregnancy, observed here, has not been described in the literature previously. In nearly 300 obstetrical cases of my practice, it has occurred only once.



Bicornual Pregnancy in a Mare: Pregnant Uterus at Full Term. 1. Head of fetus. 2. Hock Joint. 3. Vagina.

The amputation of the head has to be omitted in cases of inferior position, and with certain genital tracts whenever the forelegs, including the shoulder, have already been severed, else there is not sufficient hold to apply traction.



French Army Mules

This picture was taken in France in 1917, and shows a span of French army mules. Under the guidance of the 20th Engineers the animals soon picked up the rudiments of the English language as used by the rank and file of the American Expeditionary Forces.—E. T. B.

Brief Survey of Nutritional Diseases of Swine

By F. VOLKMAR,
Chicago, Illinois

Swine, like other farm animals, are living factories for turning crude products (food) into more refined products useful to man. In nature, the pig is an omnivorous feeder, living on herbaceous as well as on carneous food. His digestive organs are of limited capacity, requiring food that is more concentrated and digestible than that required by other farm animals. Under conditions of domestication the efficiency of this factory has been improved enormously until now, the limit of productive capacity would seem to have been reached. But such prediction has probably been voiced before only to be shown speedily to have been incorrect. The pig excels all other farm animals in the economy with which he converts feed into edible fat and flesh; he utilizes profitably many by-products of the farm, which otherwise would be lost. However, in order to achieve early fattening for market, and to assure the largest returns from the feeding operations, the rations must be properly balanced. Unfortunately, many a stockman is all too eager to meddle with the content of the standard ration. His notion in this matter is apt to be that if little is good, more must be better. Unless the required food constituents are calculated and adjusted to the ever changing needs of the developing body, the delicate balance of the nutrients, essential in a ration, easily becomes distorted. The result of it will be that the compensatory capacity of the animal organism will be taxed in an undue manner. In due course, the state of nutrition upon which undisturbed health is dependent, becomes impaired. Failure to obtain or to assimilate the nutrients needed for growth or maintenance will lead to a number of abnormal conditions varying in nature with the character, amount and importance of the constituents lacking in the daily food intake.

Water Starvation

Normally the pig needs about five to six times more water than dry substance. Insufficient water intake is likely to cause, in the course of time, severe disturbances in metabolism and, obviously, in general well being. The water content of the blood is lowered, digestion and resorption are delayed. The excretion of the nitrogen-containing products of catabolism is rendered more difficult. The body temperature rises. The appetite tends to be impaired; a dislike of solid food develops, and thirst prevails. The body organs, especially the nerves, cease to function properly.

Protein Deficiency

The proteins differ considerably in biological value depending largely upon the grouping of their constituent amino acids. Unless the proper proteins are supplied in sufficient amounts and variety, the animal

Tongue of hog with spikes imbedded in it

must starve. Life cannot be supported in the absence of nitrogen, one of the molecular components of protein. The proteins are called the building material for the body. The amino acids are called the building blocks of which proteins are made. Deficiency of proteins in the ration inhibits growth and results in loss of weight.

Fat Deficiency

Fats play a more important role in the diet than was formerly supposed. The body needs fat as a source of energy. Rations extremely low in fat bring on certain symptoms such as reduction in urine excretion, loss of hair, predisposition to rickets and to osteomalacia and cessation of growth. On the other hand, excessive fat intake delays the resorption of calcium on account of the formation of insoluble lime soaps, thus disarranging the calcium-phosphorus ratio, and causing a condition of relative acidosis.

Carbohydrate Deficiency

The principle carbohydrates are the starches and sugars. They have a definite part in nutrition. Their absence from the ration causes lack of energy for growth and work and impairs fat metabolism.

Mineral Deficiency

The mineral requirements of the body call for a large variety of minerals in the food. The more important minerals, found in the ordinary foodstuffs, are: potassium, calcium, magnesium, iron, phosphorus, and sulphur. Disturbances of the calcium-phosphorus equilibrium in the diet predisposes to rickets and osteomalacia. According to Theiler, in pigs this disturbance is brought about by a calcium deficiency. A low phosphorus diet causes loss of appetite, poor utilization of feed, impaired storage of energy, failure to make normal growth and to develop bone and muscle normally, lowering of inorganic phosphorus in the blood, and a marked increase in thirst with a corresponding excretion of urine.

Lack of iron in the diet causes anemia in suckling pigs. Lack of iodine in the food leads to goiter and hairlessness in new-born pigs.

In general, the lack of minerals in the ration causes digestive disturbances leading to depraved appetite, nervous disorders, and muscular weakness. Bohstedt (Wis. Agric. Exp. Sta.) mentioned that pigs on a diet deficient in minerals succumb to the effects of heat waves, when driven or loaded during extremely hot weather.

On the other hand, an excess of certain minerals in the ration is likewise detrimental to health. The consumption of forage or grain containing selenium leads to so-called "blind staggers", also called erroneously "alkali disease". The symptoms of this malady include loss of bristles, sloughing-off of hoofs, and consequent lameness. In young pigs the disease is often fatal. Under certain conditions an excess of sodium chloride in the food produces digestive, metabolic and nervous derangements. The symptoms of this poisoning are thirst, vomiting, masticatory convulsions, visual disturbances, bizarre movements, incoördination and paralysis. Autopsy reveals a severe gastro-enteritis.

In pigs receiving rations containing more than 0.033% rock phosphate the bones are characterized by increased thickness, loss of normal color and luster, presence of exostoses, and a decreased breaking strength. The increase in the thickness of the mandible of pigs on rock phosphate diets is due to an increase in the size of the medullary spaces. A change also occurs in the bone marrow. When swine are fed raw rock phosphate (lime phosphate) in excess of 0.4% of the ration, they are likely to exhibit ill effects, characterized by loss of appetite and weight, sufficient to interfere with estrus, and in turn to result in fewer pregnancies. Additional symptoms observed are drowsiness, weakness and paresis. Autopsy reveals swelling and erosion of the gastro-intestinal mucosa, and hemorrhages. The harmful factor present in raw rock phosphate is fluorine. Excessive amounts of fluorine cause also hypoplasia of the enamel of the teeth. The teeth of pigs on such rations over long periods of time become so soft that they wear down until in some cases the pulp cavities are exposed. Rock phosphate can be fed to pigs at 0.5% levels for short periods with-

out danger of toxicity, but for longer periods this amount has to be reduced. Excessive doses of iron salts will form insoluble phosphates, and thus predispose to rickets by delaying the resorption of phosphorus.

Nutritional Anemia

Swine have a low iron reserve. The hemoglobin content of pigs at birth ranges between seven and fifteen grams per 100cc of blood. During the first few days after birth there is a rapid decrease of hemoglobin until, toward the end of the nursing period, a state of physiological iron deficiency is reached. Iron deficiency occurs frequently in pigs farrowed in winter, when kept indoors with no opportunity to

Acites probably due to Nutritional Anemia

replenish the iron supply and becomes pathological—even fatal. In the case of litters removed outdoors, the decrease stops, and the birth level of hemoglobin is, eventually, again reached. Pigs suffering from iron deficiency appear languid and sluggish; their skin becomes pale and spongy; respiration is labored (thumps). The conspicuous gross lesions consist of hypertrophy of the heart muscle, pulmonary edema, exudative pleuritis and peritonitis, hypertrophy and mottled appearance of the liver; the spleen, too, is often hypertrophied. On histological examination a degenerative fatty infiltration of the liver and of other visceral organs will be found. Experience has shown that the recognition of the gross lesions by the practitioner is often difficult.

In a series of post-mortem examinations upon more than 100 anemic piglets, the writer was able to confirm the gross pathological diagnosis by a rapid color method for the differentiation of fat in gross specimens. The method is so simple that it can be carried out easily, either in the field or in the office, by any practitioner. The equipment needed consists of a 100cc flask containing an alcoholic solution of Sudan red, a 100cc flask containing wood alcohol, a 100cc flask containing absolute alcohol, and a staining dish. The technic is as follows: The organ (preferably the liver) is appropriately cut into thin slices not more than half an inch in thickness. (The thinner the slice, the more rapid the staining, the better the bleaching, and the more clear-cut the final result). Immerse one or several of the slices in an alcoholic solution of Sudan red, and leave it, or them, in the dye from 15 to 30 minutes, depending on the thickness of the slice. The result of the dying process is a diffuse deep-red staining of all the tissue cells, being most marked, of course, in the fatty tissue. Remove the slice from the Sudan red, and wash well in running, cold water; immerse it now in ordinary, commercial, wood alcohol, and wash carefully. A few minutes usually suffice to remove the stain from the surrounding non-fatty tissue. The specimen has to be watched carefully all the time it is bleaching in the wood alcohol. A final washing in absolute alcohol for about a minute further emphasizes the differentiation of the stained fat from the other tissues. If there is any indication that the diagnosis may be contested, the stained tissue may be preserved in 2% formalin, and properly labeled for record and future reference.

A-Avitaminosis

The vitamin A requirements of growing pigs are not very high; nevertheless, swine are very sensitive to vitamin A deficiency in the ration. Symptoms of avitaminosis A appear in swine in about two to four months, following the feeding of the deficient ration. The disease is characterized by a catarrhal conjunctivitis which, how-

ever, rarely leads to xerophthalmia. Other symptoms are blindness, nervous disorders, incoördination of movements terminating in posterior paralysis, and convulsions. Elder (Mo. Agric. Exp. Sta.) mentions also diarrhea, emaciation, dermatitis, and an intense itching. He observed further that white pigs exhibit a marked pink coloration of the skin. F. Hale (Texas Agric. Exp. Sta.) depleted young sows of vitamin A by withholding it from the ration for a period of about five months. These vitamin-lacking gilts were then bred to normal, well-fed males. About a month after mating, vitamin A was restored to the ration in adequate amounts. The mother pigs recovered quickly from all symptoms of vitamin deficiency, and in due course delivered a normal number of pigs. But the pigs were born blind and remained blind, if they lived at all, for the rest of their lives; and this in spite of the fact that their dams had an abundance of all the vitamins during the greater part of the gestation period, except for those first few weeks of embryonic life. Lack of vitamin A in the ration, also, lowers the resistance to infection and parasitic invasion. Hiraishi has demonstrated that pigs kept on a ration deficient in vitamin A proved less resistant to ascaris invasion than the controls which received cod liver oil in their diet.

Following the drouth in 1934, an intense bloody diarrhea in swine was observed in eastern Nebraska and Iowa, that proved unyielding to any kind of treatment, but yielded to the administration of fish oils without other treatment. Ray (1936) concludes that the pathological condition is essentially a break down of the defensive properties of the mucous membrane of the intestine due to a lack of vitamin A in the diet.

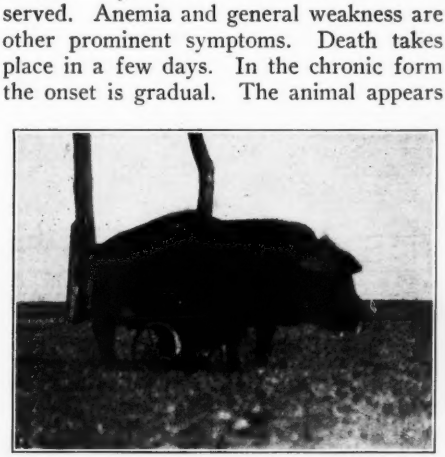
B-Avitaminosis

Little is known about the vitamin B requirements of swine. Rommel and Vedder (1915), concluded from their experiment that pigs are susceptible to beri-beri when fed on a vitamin deficient ration, such as polished rice. They believe that the so-called "cottonseed poisoning" in pigs is probably a deficiency, and that acute cotton seed poisoning corresponds to wet beri-beri, and the chronic form to dry beri-beri.

C-Avitaminosis

The vitamin C requirements of the pig are said to be small. Orr and Crichton (1924) have shown that pigs on diets deficient in vitamin C did not develop signs of malnutrition which could be ascribed to a deficiency of that factor. Hughes and associates (1928) reported good growth and reproduction in swine fed a low vitamin C ration over a long period.

There exists a condition in swine generally known as "scurvy". This disease, however, seems to be more of the nature of a "morbus maculosus" than of a vitamin C deficiency. Scurvy may be observed in swine either as an acute or as a chronic condition. The acute type is characterized by multiple hemorrhages into the skin. The sizes of the hemorrhages vary from the size of a pinhead to that of a silver dollar. The skin looks as though purple ink had been splashed all over the animal. Often, the hemorrhages occur following slight trauma, such as occasioned by restraint. The mucous membranes are likewise affected, causing epistaxis, hemafecia, and hematuria, depending on the type of mucous membrane involved. The gums are often swollen and exhibit hemorrhages. Occasionally erosions and ulcers are observed. Anemia and general weakness are other prominent symptoms. Death takes place in a few days. In the chronic form the onset is gradual. The animal appears



Paraplegia in a sow. The cart facilitated getting about the feed lot.

less alert than usual; the appetite becomes impaired, but thirst is increased. After awhile edematous areas and hemorrhages appear in the skin. The bristles lose their luster and can be pulled out in patches. The gums are swollen and inflamed; they bleed readily, and are often the seat of erosions and ulcers. Halitosis is present. The teeth are loose, and are apt to fall out. Finally, anemia and general weakness set in; the joints swell, and partial paralysis of the hind quarters sets in.

D-Avitaminosis

Pigs have a definite need for vitamin D in their ration. Their requirements for this food factor is especially high during the developmental stage, because vitamin D is essential to normal mineral metabolism. The diseases resulting from lack of vitamin D in the ration are rickets and osteomalacia.

Rickets.—As a rule, rickets is dependent for its occurrence on the calcium-phosphorus ratio in the diet, that is, on an existing acalciosis, according to Theiler. Indirectly it depends on climatic and geographic factors. In general, only young pigs are affected. The clinical manifestation of the impaired utilization of calcium and phosphorus is unthriftiness and runtiness. Pigs developing rickets become less active; their appetites languish or become perverted, causing them to gnaw the walls and partitions of their pens, and even to drink liquid manure. The animals acquire a harsh, bristly coat of hair, and a wrinkly skin. Retardation of growth, and development of a pot-belly are observed in succeeding stages. The faulty calcification of the bones results in soft bones, which are easily deformed, and may fracture spontaneously. So-called "beading" of the ribs is often seen. Affliction of the bones is indicated either by a stiff gait, or by lameness. When the pigs are made to get up, or to move, they utter cries and either walk on their fore knees, or drag their hind limbs. Swelling of the bones takes place, usually, at the joints or at the junction of bone and cartilage. Rickets in itself is rarely fatal, but has a tendency to heal. It causes a predisposition to secondary infections, especially to respiratory and gastro-intestinal catarrhs.

Osteomalacia is a disease of the bones of mature hogs caused by a depletion of the body of calcium salts, especially during pregnancy and lactation, leading to deformity of bones. For the reason that pigs are commonly marketed before they reach maturity, this disease is quite rare, except in breeding animals. Prophylaxis and therapy are the same as for rickets.

Osteofibrosis.—It seems expedient here to discuss briefly osteofibrosis (pseudo-rickets). This disease, of course, is not exactly of nutritional origin, but often complicated with rickets and sometimes mistaken for rickets. The symptoms in pigs are tumefaction of the facial bones, especially of the maxilla and the mandible. The swelling of the facial bones is not only toward the outer surface, but also toward the inner surface; thus, narrowing and contracting the nasal passages (bull-nose). The respiration becomes labored and difficult (sniffles), and suffocating spells may be observed. The swelling of the hard palate interferes with proper mastication of the food.

Tetany has been observed in pigs of different ages. Tetanic seizures are undoubtedly of parathyreogenous origin, although, they are quite frequently seen in cases of rickets and osteomalacia. They are, therefore, often considered as symptoms of these diseases. Tetany is characterized by hypocalcemia, general convulsions, and convulsions of specific groups of muscles, for instance in laryngospasm. These spasms may repeat themselves in the course of several weeks. In laryngospasms they either cause death by suffocation, or gradually disappear again. A tendency to tetany is also observed in many gastro-intestinal disturbances.

Other Avitaminoses

Little, if anything, is known about the requirements of swine for any of the other recently discovered vitamins. It is said that the female organism has an ability for storing vitamin E. In laboratory animals,

the lack of vitamin E in the ration causes a primiparous animal to refuse to nurse its young. When the avitaminosis E continues into the second pregnancy, the young will be born dead. If the avitaminosis E should happen to continue into the third gestation, the embryos will be autolyzed and resorbed. In male laboratory animals, the lack of vitamin E in the diet causes the testicles to atrophy and the spermatozoa to lose their agility and motility. Presumably the usual rations of swine contain sufficient of this vitamin for the animal's needs.

Vitamin F was formerly supposed to be the lactation vitamin; it is said to be needed by the skin. Its administration to laboratory animals is claimed to improve skin color and circulation, and to aid in anemic conditions of deficiency origin. Its absence from the food of laboratory animals results in dry skin, fatigue, distress in hot weather, constipation, and friability of bones.

Vitamin G is the anti-pellagra factor. When laboratory animals are deprived of it, their growth will be retarded, and they lose weight. Additional symptoms are soreness of eyes, nose, and mouth, lethargy and weakness. Although hog muscle is very rich in this vitamin there is no research finding to indicate precisely its place in the diet of swine.

Vitamin H is found in liver, kidneys, muscles and yeast. Its lack in the ration of laboratory animals is said to cause a "status seborrhoicus". The literature contains no record of the effects of vitamin H deficiency in swine.

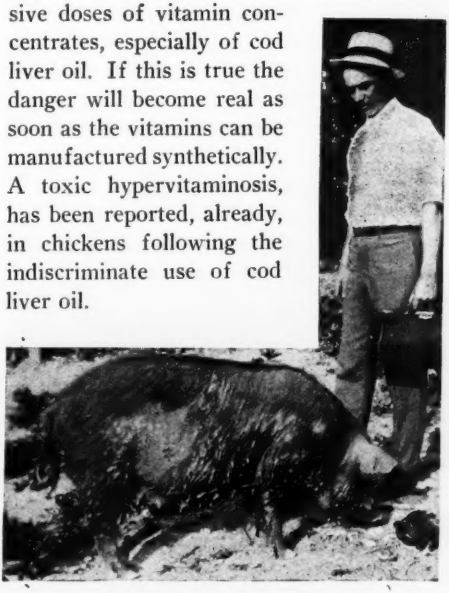
Vitamin I is called the anti-pneumonic factor. It is present in lemon juice, elderberry juice, and currant juice. When laboratory animals are deprived of this factor they become predisposed to pneumonia.

Vitamin K is called the coagulation factor. It occurs in the liver fat of boars, to a lesser extent in egg yolk, hemp, and alfalfa. Its absence in the body retards the coagulation time of the blood. In chickens vitamin K deficiency produces a scurvy-like disease. Vitamin K deficiency has not been recognized in swine. The possibility exists that some of the scurvy-like conditions in this animal derive from this deficiency.

In studies at the Animal Nutrition Research Institute, a growth promoting, or appetite-stimulating factor "physin", which was shown to give rise to an accelerated growth rate in laboratory animals, produced a similar marked effect in hogs, when added to an adequate diet of natural feeding stuffs. The increased response was approximately 40%. Physin acts through stimulating the appetite and general growth, and does not enhance the net energy value of the ration.

Hypervitaminosis

In contrast to proteins, fats, and carbohydrates, which are found, usually in liberal amounts, in most foodstuffs, the vitamin content of the various feeds is exceedingly minute. While it is quite possible to create a hypovitaminosis in the ration by shifting the percentages of the ingredients, or by substituting other foods, it is not so easy to create a hypervitaminosis. Nevertheless, there are certain food supplements in which the vitamin content is high. It is believed although not certain that a hypervitaminosis can be induced by excessive doses of vitamin concentrates, especially of cod liver oil. If this is true the danger will become real as soon as the vitamins can be manufactured synthetically. A toxic hypervitaminosis, has been reported, already, in chickens following the indiscriminate use of cod liver oil.



Cesarean Section in a Sow

Chick Vaccine
for Equine Encephalomyelitis

By DRS. B. M. LYON and R. W. G. WYCKOFF,
Pearl River, New York

VACCINATION for the prevention of equine encephalomyelitis with the new chick vaccine indicates a definite control measure has been established. Records of well over 250,000 horses vaccinated to date, in the United States and Canada, have yet to report a protection failure or an unfavorable reaction. Seldom, if ever, has a veterinary control measure been so rapidly and universally accepted. Two chief factors have been responsible for this record: (1) The emergency resulting from the rapid spread of this disease, which yearly is becoming an ever increasing threat to the horse population of the country and (2) the vastly greater protective properties demonstrated with the chick vaccine when compared with the vaccine prepared from diseased horse brains.

A study of a series of horse brains used in the preparation of vaccine, as developed by Giltner and Shahan, has shown that the average horse brain contains 1000 guinea pig lethal doses of virus per gram. Diseased chick embryos, on the other hand, have a virus content approximately 100,000 times greater or 100,000,000 lethal doses per gram. This increased virus concentration is, undoubtedly, responsible for the greater protective value of the chick vaccine.

This greater protection is readily demonstrated both in guinea pigs and horses. In one experiment (Chart I) a group of guinea pigs was vaccinated with two doses of chick vaccine, while the pigs in three other groups received two doses of horse brain vaccine. The inoculations were made one week apart. Two weeks later, all animals, and a further group of unvaccinated controls, were inoculated intracerebrally with 1000 lethal doses of virus. As the protocol shows, all animals receiving the horse brain vaccine and all the controls died promptly with typical symptoms; on the other hand, all chick vaccinated animals remained perfectly well and active. These experiments have been repeated frequently, always with the same results.

Horses vaccinated with chick vaccine acquire such a substantial degree of immunity that they become able to withstand the intracerebral injection of many lethal doses of virus. The results of an experiment demonstrating these facts are summarized in Chart II. In this test, two groups of horses were inoculated at intervals of ten days, the dose of chick vaccine being 10cc and of horse brain vaccine 25cc. A month after the second vaccination, all horses, together with the unvaccinated controls, were given 0.5cc intracerebrally of a 1:300 dilution of a highly infectious guinea pig brain. As the chart shows, both the controls and the animals vaccinated with horse brain vaccine

CHART I

Record of Guinea Pig Vaccination with Chick and Horse Brain Vaccines. Dates of Vaccination: 4/8/38 and 4/15/38. Date of Virus Injection: 4/22/38.

Animal No.	Dose of Vaccine C.C.	Dose of Virus M.L.D.	OBSERVATIONS Date 4/29	Date 4/30	Date 5/1	Date 5/2	Date 5/3	Date 5/4	Date 5/5	Date 5/6	Date 5/7	Date 5/8
(Chick Vaccine No. 36 (from 10% suspension).												
2915	1cc	100	A	A	A	A	A	A	A	A	A	A
2913	"	1000	A	A	A	A	A	A	A	A	A	A
2914	"	1000	A	A	A	A	A	A	A	A	A	A
2911	0.3cc	100	A	A	A	A	A	A	A	A	A	A
74	"	100	A	A	A	A	A	A	A	A	A	A
73	"	1000	A	A	A	A	A	A	A	A	A	A
Lederle Horse Brain Vaccine 151V209.												
2920	1cc	100	A	A	P	D	....	....	....	....	....	....
2910	"	100	A	A	A	A	D	....	....	....	....	....
2912	"	1000	A	A	A	P	D	....	....	....	....	....
2919	0.3cc	100	A	A	A	P	D	....	....	....	....	....
Manufacturer B. Horse Brain Vaccine No. 612.												
2916	1cc	100	A	A	A	A	D	....	....	....	....	....
2918	"	100	A	A	A	P	D	....	....	....	....	....
2907	"	1000	A	A	A	P	P	D	....	....	....	....
2909	0.3cc	100	A	A	A	A	D	....	....	....	....	....
Control Animals.												
1119	0.0	100	A	A	P	D	....	....	....	....	....	....
1120	"	100	A	A	A	P	P	D	....	....	....	....
1121	"	100	A	A	A	P	P	D	....	....	....	....
1122	"	1000	A	A	P	D	....	....	....	....	....	....
1123	"	1000	A	A	A	P	D	....	....	....	....	....
1124	"	1000	A	A	P	D	....	....	....	....	....	....

A—active P—paralyzed D—dead

died promptly of encephalomyelitis, while the animals vaccinated with chick vaccine survived without manifesting any symptoms of disease.

CHART II

Record of Horses Vaccinated with Chick and Horse Brain Vaccines. Dates of Vaccinations: 5/3/38 and 5/17/38. Date of Virus Injection: 6/18/38.

Animal No.	Dose of Chick Vaccine	Dose of Horse Brain Vaccine (20% Emulsion)	TEMPERATURES Date 6/17	Date 6/18	Date 6/19	Date 6/20	Date 6/21	Date 6/22	Date 6/23	Date 6/24	
	Chick Vaccine 187V2.										
9481	10cc	0.5cc	100.0	100.0	100.2	100.4	100.2	100.0	100.4	100.2	No symptoms at any time.
9485	"	"	99.4	99.6	99.4	99.4	99.8	99.4	99.6	99.4	" " " "
9486	"	"	100.6	100.2	100.4	100.4	100.0	100.0	100.2	100.0	" " " "
	Horse Brain Vaccine: 187V216.										
9482	.25cc	"	100.4	100.0	100.8	100.2	102.6	103.4			Paralyzed, destroyed.
9483	"	"	100.0	99.8	100.4	99.6	103.0				Paralyzed, destroyed.
9495	"	"	99.6	100.0	100.6	103.0	104.6	101.4			Paralyzed, destroyed.
	Controls.										
9588	0.0	"	101.0	100.6	102.0	102.4	103.6	104.0			Paralyzed, destroyed.
9589	"	"	102.2	100.0	100.0	99.6	101.6	103.0	104.4		Paralyzed, destroyed.
9590	"	"	100.0	99.6	101.0	100.6	103.8	104.0			Paralyzed, destroyed.

The immunity conveyed by chick vaccine has been so solid in experimental animals that we were convinced a substantial degree of protection would develop in less than two weeks after the customary second vaccination. We have, accordingly, set up experiments in which guinea pigs have been given massive intracerebral injections of virus one week after a single vaccination with a 0.5cc dose of chick vaccine. As Chart III indicates, these animals already display a high degree of immunity. The protection they have acquired, however, is not maximal, since we find that a few animals are not protected by a single dose, whereas we never lose dually vaccinated animals.

In view of the surprisingly high degree of immunity built up in a week against heavy doses of virus, we are seeking to follow the day-by-day development of this protection. These experiments are not yet complete; but they indicate a measurable degree of protection to animals infected 24 hours after the first dose of vaccine. Such a result is important since it indicates that animals may be successfully protected by vaccination even under epidemic conditions. When chick vaccine is used, the so-called negative phase of increased susceptibility immediately following vaccination, has never been observed. Thus far, during the year, over 250,000 horses have been successfully vaccinated with this new vaccine.

Experiments have been set up to establish the duration of protection. Results thus far upon guinea pigs indicate a solid protection at the end of six months. A complete report will be given when sufficient time has elapsed to establish the time of waning protection. These same experiments are being conducted upon horses. It is assumed that the duration of immunity will be extended in proportion to the increased protection established.

The experiments described herein have been made with the western strain of equine encephalomyelitis. A potent vaccine, however, that protects against massive doses of

CHART III

Record of Guinea Pigs Injected with Virus One Week after a Single Vaccination with Chick Vaccine

Animal No.	Dose Guinea Pig Lethal Units	Dose of Vaccine	OBSERVATIONS Date 7/13	Date 7/14	Date 7/15	Date 7/16	Date 7/17	Date 7/18	Date 7/19	Date 7/20	Date 7/21	Date 7/22
	Vaccine No. 187V45. Date of Vaccination: 7/5/38. Date of Virus Injection: 7/13/38.											
2300	30	0.5cc	A	A	A	A	A	A	A	A	A	A
2302	30	"	A	A	A	A	A	A	A	A	A	A
2305	30	"	A	A	A	A	A	A	A	A	A	A
	Vaccine No. 187V34. Date of Vaccination: 6/20/38. Date of Injection: 6/27/38.		6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5	7/6	7/7
1202	100	0.5cc	A	A	A	A	A	A	A	A	A	A
1265	100	"	A	A	A	A	A	A	A	A	A	A
1261	100	"	A	A	A	A	A	A	A	A	A	A

the more virulent eastern virus strain has also been made from chicken embryos.

Summary

An especially potent vaccine against equine encephalomyelitis has been produced from formalinized virus propagated upon chick embryos.

It is shown that this vaccine will give complete protection to both guinea pigs and horses injected intracerebrally with many lethal doses of western strain virus.

The superiority of this new vaccine to that prepared from diseased horse brain is demonstrated in these experiments; all horse-brain vaccinated animals succumbed to encephalomyelitis as promptly as did the unvaccinated controls, whereas, all "chick" vaccinated animals were completely protected.

Chick vaccine produces immunity so rapidly that its use may be recommended during epidemics, even though exposure may occur before the course of vaccination has been completed.

To date during 1938 over 250,000 horses have been successfully vaccinated with this new vaccine.

Pyelonephritis*

By R. A. McIntosh, Guelph, Ontario

The occurrence of this disease is apparently increasing. Four cases from widely separated districts were submitted to the Ontario Veterinary College clinic during the 1936-1937 term. Because it is a highly fatal disease and also because the infection causing it in cows is evidently specific, a report of the condition should be timely.

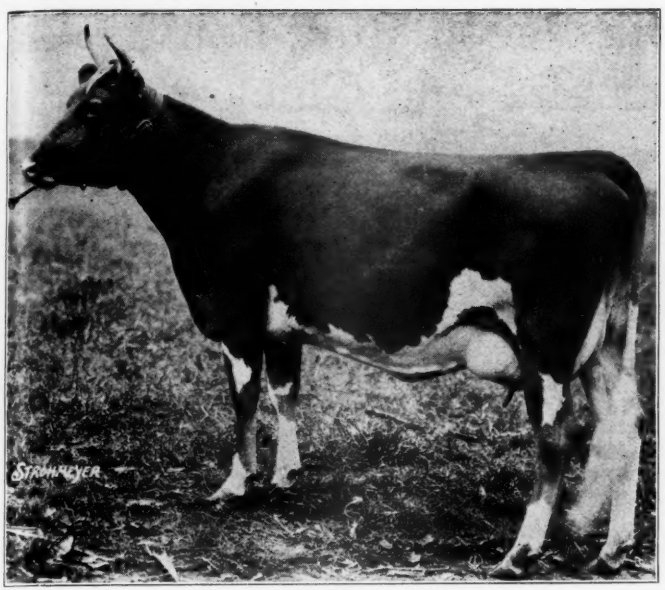
As the term indicates, pyelonephritis is an inflammation of the pelvic portion of the kidneys, but the inflammatory reaction frequently involves also the ureters and the bladder. The disease is chronic and gives rise to the discharge of urine containing pus, tissue detritus and ofttimes it is blood stained. It is caused by the *Corynebacterium renalis*. The organism has also been reported as causing the condition in swine, sheep, horses and dogs. Boyd of the University of Minnesota reported eight cases in horses in which the *Corynebacterium renalis* was isolated. In cases where this infection is found responsible for the condition, it is believed that the organism ascends the renal tract from the external genitals and bladder through the ureters and on into the pelves of the kidneys. Since the organism can be found in the mucosa of normal animals and is widespread in nature it is believed that other factors enter into the occurrence of the disease and in this regard severe parturient disease and genital infections are apparently contributary.

The manifestations and symptoms of the disease are quite varied in character. Usually the condition is well established before skilled assistance is acquired or a diagnosis made. In one of the clinic cases of last year the infection was apparently confined to the bladder for the symptoms of cystitis were all that could be observed and the animal recovered in the course of a few months. All other cases submitted to the clinic have terminated fatally. History records usually reveal a loss of condition over a period of weeks or more often months. The appetite may remain fair but the loss of flesh and the gradual decline in the amount of milk being secreted continues. In one of the cases brought here the owner stated the first intimation he had of the cow being sick was in the nature of a rather violent colic. She lay down and got up repeatedly; would kick at the abdomen and switch her tail. Following this performance she went off her feed for a week. She then commenced eating a little but her appetite remained capricious and she passed blood-stained urine. At the time of urination considerable uneasiness was manifested by treading and switching. During the time this animal was under observation at the college she gradually lost flesh, her urine always contained pus mucus, blood and tissue débris. A rectal examination revealed a greatly enlarged right kidney, and the Corynebacterium was cultured and identified from the urine.

Another case of this nature in which a more complete history was obtained is as follows: The owner purchased the animal in the spring of 1936. She was two years old and pregnant. Shortly after getting her home it was noticed that her tail was frequently smeared and encrusted with pus about the level of the vulva. She calved on July 17th, following which she became unthrifty and by the middle of September was badly affected. About October 1st she went off her feed entirely but recovered somewhat through the administration of medicine. She was submitted to the clinic on October 15th and found to be greatly emaciated, almost dry, the urine contained blood, pus, mucus and tissue detritus. The right kidney was enormously enlarged and the corresponding ureter an inch in diameter. Bacteriological culture revealed Corynebacterium. The owner of this latter cow had had an older cow similarly affected the year before.

Except in those instances where there is a manifestation of renal colic there are no

* Presented at the 10th Veterinary Conference, College of Veterinary Medicine, The Ohio State University, Columbus, O., June 16-18, 1937.



Left: A pure-bred Guernsey cow afflicted with specific infectious pyelonephritis at the time the case was discovered. The specific diphtheroid organism causing the disease was isolated in pure culture from the left kidney, which was greatly enlarged. The renal lesion was discovered incidental to an examination for pregnancy. Although the pathological changes were well advanced at time of discovery the animal was in apparent good health and remained so throughout the following year. The only symptom observed was frequent urination. After 12 months she was noted to be losing flesh and her appetite was impaired. Within a month her condition became hopeless. Below: The same animal shortly before she was destroyed. *—Photos by C. C. Palmer*

violent symptoms of any kind. The disease runs a chronic course with ultimate emaciation and anemia. Treatment is of no value except possibly as in the cases such as the one mentioned first, where the infection was apparently confined to the bladder. In that instance the bladder was irrigated with a saturated boric acid solution a few times and an ounce of 5% argyrol solution injected afterwards. It is obvious, however, that little can be done when the kidneys are involved.

It is of value, however, to be able to diagnose and recognize these cases and the chief diagnostic features are the painful urination and the altered character of the urine itself. The presence of pus, tissue débris and blood in the urine are most significant. The chronic character of the disease and the progressive emaciation are also suggestive. A rectal examination in which the enlarged kidney and ureter can be palpated substantiates other findings and is most diagnostic.

Technique in Vaccinating Poultry for Laryngotracheitis and Chicken-Pox

By IAN C. McDONALD,
Kansas State College, 1938

Introduction

The advances made in the poultry industry in the past few years have increased its importance in our present day agricultural scheme and made the poultry husbandry field a good one for the practising veterinarian. More people are now directly interested in the raising and care of poultry than in any other class of livestock. At the time of the last census 85% of all the farms in the United States had poultry—a higher percentage than that of any other type of livestock. The increasing importance of the poultry industry means that the veterinarian must be prepared to meet the demands of the poultry man in controlling disease conditions.

Indications for Vaccination

Vaccination of poultry against laryngotracheitis and chicken-pox is indicated where the disease is present on the farm as an annual occurrence, or is present in the locality causing heavy losses during the growing season.

Pullets two to four months old are best suited for vaccination because they are in good health and not yet in production. They may be vaccinated against laryngotracheitis and chicken-pox at the same operation. This is possible because the reaction of the laryngotracheitis vaccination is over in five to six days, while that of the chicken-pox does not reach its height until the twelfth day.

Equipment Needed

The necessary equipment is inexpensive and can be made by hand. A four-panel gate, which is essential in catching the birds, can be made of surfaced lathe spaced the width of a lathe apart to form a panel 30 inches wide, 45 inches high. Four of these are connected with hinges or iron rings to form the catching gate. In cases where the construction of the house makes it necessary to work out of doors, a catching coop is better suited for the purpose. This may be constructed somewhat similar to a shipping crate with removable gates at one end and in the middle.

A vaccination table is made in collapsible form so that it may be folded when carired in the car. A convenient size is 45 inches high with table top 12 by 30 inches. A long-handled catching net is needed to catch the last few birds and retrieve birds that escape. A mechanical counter is invaluable in counting the birds that are vaccinated. If the counter is sewn into the palm of a finger-less glove (right hand) it can be operated with the same hand that operates the brush in vaccinating. As a measure of sanitation a good chlorine disinfectant, a scrub brush, and a pail are used in cleaning up after a job.

Setting Up Equipment

The poultry house is to be considered in setting up the equipment because its construction may vary the procedure to a marked degree.

If it is favorable for the entire vaccinating process to take place inside the house, then the four-panel gate and the vaccination table should be set up in the most convenient position, which is usually a corner adjacent to the run. In this position the birds are easily driven into the enclosure, vaccinated, and released into the yard. It is helpful to fence off the floor area under the roosts in order to prevent the birds from getting into inaccessible places. Since it is easier to operate the catching gate on a bare floor, all litter should be removed from the area.

Where the vaccinations must be done outside the house, it is necessary to use the catching coop. The open end of the catching crate is placed against the "let" and the birds driven from the inside out into the

coop. One precaution must be taken—the crate should not be filled so full that it cannot be emptied before the birds become overheated.

Procedure

In driving the poultry only a few birds (60 to 70) should be driven at one time. In small lots they are more easily handled and less likely to crowd in the catching gate.

The poultry man kneels inside the catching gate among the birds and hands them to the assistants standing between the gate and the vaccinating table. This gives the owner an opportunity to examine the birds closely and to remove all culls; he can also keep the birds from crowding, thus preventing deaths from suffocation.

The assistant grasps the bird in his left hand with the anterior part of the thigh in his palm and sets it head down on the table. Then by passing the right hand over the tail region and down onto the back, he clears the site of vaccination of feathers and holds the bird more accurately.

The veterinarian, facing his assistants across the vaccination table, holds the vaccine bottle and small cloth wiper in his left hand and in his right the small camel's hair brush. He also wears the counter on his right hand.

The veterinarian opens the cloaca with the forefinger and thumb of the left hand and brushes the vaccine into the mucous membrane on the dorsal part of the cloaca. If the bird passes any fecal material during the vaccination, the operator should wipe it away and apply more vaccine. The bird may then be carefully released into the yard or adjoining room.

The birds can be vaccinated for chicken-pox at the same time by another operator. He stands between the assistants and faces the veterinarian. As the assistants receive the birds from the catcher, they extend the left wing in front of the pox vaccinator, who pierces the web with the vaccinating instrument. An instrument that serves well can be made from a 5 or 6 by 5/16 inch dowel stick bound with linen thread on one end. In this end are driven two No. 6 sewing needles spaced 3/16 inch apart, so that the eyes or heads of the needles remain out ½ inch.

The web should be pierced as near its margin as possible, care being taken to avoid all blood vessels.

The last few birds to be caught present a problem which can be easily overcome. Use the catching gate as a sweep and surround the birds in another corner. This surprise attack will baffle the smartest birds. Also the catching net is very handy in securing the most elusive ones.

Reading the "Takes"

On the fifth day after vaccination, the birds are ready for both laryngotracheitis and chicken-pox "takes." The pox "takes" are not as well-marked as they are on the twelfth day, but can nevertheless be read with a high degree of accuracy. A swelling and inflammation at the site of injection on the left wing web indicates a positive reaction or a "take" for chicken-pox. Then by placing the bird head-first between the knees and prolapsing the cloacal mucous membrane, the reaction may be read for laryngotracheitis. A swollen, congested mucous membrane indicates a positive reaction.

It is necessary to read only 10% of the birds vaccinated. They may be caught by using the same procedure as for vaccination.

Summary

The increased importance of the poultry industry and the education of the poultry man has created a demand for the services of graduate veterinarians.

It has been proved that vaccination against laryngotracheitis and chicken-pox is efficient and will reduce the high mortality in growing birds.

The equipment necessary should be light and compact for easy handling. Strict sanitation is absolutely essential.

Veterinarians should remember that the poultry man will judge him by his efficiency in handling the flock. He must work smoothly, quietly and rapidly, and he must be certain every bird is vaccinated. Only sufficient preparation can assure this.

The Equidae in Peru

By DANIEL A. TOVAR,
Callao, Peru

Up to now horses have been raised in Perú only for the saddle and the pack. They are a type of Berber with faint Arabian strains brought originally from southern Spain 400 years ago. Mules bred from these horses are rather small and fine boned, not larger than the "mine mules" of the United States.

All along the coast of Perú this breed of horses has maintained for all these years its original fine points, but in the uplands known as "sierras," it has degenerated to a point that in some parts the animals resemble Shetland ponies.

As a general rule, horses in Perú are very healthy; seldom, if ever, are they sick. Some in their whole lives never need a dose of medicine. A practitioner dependent upon the treatment of horses would starve in Perú. It never rains on the coast, but in the sierras we have a dry and a wet season. The prolific wet time lasts only three months of the year; hence the irrigation and the higher price of irrigated lands. Millions of acres of level, beautiful land on the coast are barren deserts for lack of water. On the eastern slopes of the Andes, where our frontier of civilization lies, the rainfall is heavy and the vegetation luxuriant, forming the vast territory of the "montaña" or largely unexplored jungle-land of Perú. There are practically no horses and very few mules in the montaña.

Hacendados (ranchers and landlords) raise horses as a fad. Horses are reared in a haphazard way with no knowledge of genetics, but with a great deal of pride. Horses are never used for draft, but only for riding purposes and the best of them are ridden only on great occasions such as National Day festivities or other gala days. Hacendados are so considerate of their horses that I have seen cases where peons were sent out to pull loads and carry heavy packs while the horses were munching in their stalls.

The Peruvian saddle horse known as "caballo nacional," is a fine looking, somewhat nervous, rather fat, short backed, exceedingly necky, heavy maned, oversexed beast. Standing about sixteen hands high, it has fine bones and small hoofs. Rather slow in maturing, an 18-month-old stallion will sell for from $100 to $500. Fine specimens are not easy to obtain. These horses are never trained before their third year and their schooling must be completed when four. The schooling is elaborate and when finished a horse must be able to turn sharply to right or left, rear and especially halt suddenly when ordered to do so, to an extent that the animal seems, for a moment, to sit on his haunches. During horse meets and shows, one may see riders on the least excuse halting their mounts and turning to right or left just to show off. The walk is slow, not more than three miles an hour, and in walking, the head is held down and the front hoofs turn rhythmically with an elegant outward circular motion. The tail must be held tightly against the body, as a fly shooing tail is taboo.

The mountainous nature of the country, plus the admiring love of the Spaniards for their horses and fine riding mules, did not favor the development of the solidungulates to do any sort of agricultural work; hence the extensive sandy, flat lands of the coast suited to sugar cane and cotton, shifted from hand labor and ox directly to the ultramodern mechanized age. Up in the sierras, where the land is hilly, man labor is still used, even to break new soil. Oxen till the suitable parts as formerly they did on the coast, while horses and mules are used on pack trains only.

The mines, located sometimes on inaccessible condor-nested peaks, would not be able to transport their fine metals were it not for the dignified, graceful, fine-looking llama. The worth of this useful animal was unbelievably overlooked by the myopic, conceited peninsulars who conquered Perú and their equally short-sighted descendants, on the fatuous pretext that this

fine animal harbored the germ of syphilis. The llama is a fine wool bearer, yielding as much as 25 pounds of very fine wool at a clipping. Its meat is excellent, it can pack a load of 100 pounds where mules would roll off a mountainside, and up in the cordilleras, so bleak, cold and barren, where one cannot find even a stick for kindling, a little dry llama dung is always available to warm one's meal so that one's blessings upon the animal come spontaneously.

Equine afflictions in Perú include encephalomyelitis and strangles, which kill the most horses. Occasionally they fall victims to stomach worms, tetanus and afflictions of old age, but as a general rule, they are free of diseases, even parasitic. Bots are just beginning to show up these last few years. We have no dourine, surra, mal de caderas, glanders nor swamp fever and up in the sierras tetanus and even encephalomyelitis are unknown, as is also poll-evil, probably because there is as yet no brucellosis in those regions.

Army horses, which are all imported from neighboring Chile, and race horses imported from the Argentine and Chile, are about the only ones affected with gastro-intestinal troubles.

A dead horse is nearly always buried under a fruit-bearing tree or left where it falls, to be devoured by stray and pariah dogs, but near Lima, old and disabled horses are slaughtered to feed the packs of racing greyhounds at the Lima Kennel Park.

Chronic Lameness in a Stallion

February 28, 1938, a purebred Belgian stallion, 19 years old, was presented for treatment at the veterinary clinic of Kansas State College. He was affected with grease-heel, contracted heels, and thrush, and was unable to breed because of his foot trouble. He showed lameness on soft ground or gravel; his feet had become more oval than round, and the frogs showed that there had been no pressure upon them for some time. He had been treated by laymen with copper sulphate packs, but had not responded to the treatment. Creolin had been applied for the grease-heel, and this condition was improving, but he presented a typical picture of thrush and contracted heels. The frogs were necrotic and showed raw, bleeding surfaces. He appeared to be walking on only the toes of his feet, the posterior portion receiving no pressure, and the hoof walls were so long that frog pressure was impossible.

Treatment was as follows:

February 28, 1938.—The hoof walls were trimmed and the necrotic portion of the frogs was cut away. A powdered copper sulphate pack was applied to each foot. Glycerine and tannic acid were applied to the heels.

March 4, 1938.—The walls of the hoofs were again trimmed, the necrotic tissue of the frogs was removed, and copper sulphate packs were again applied. Maggots were found on the grease-heel of the front feet. They were removed with chloroform, and glycerine and tannic acid were applied.

March 8, 1938.—At this time the back feet had shown considerable improvement. They were again trimmed and the necrotic portion of the frogs removed. An aqueous bichloride of mercury pack 1/1000 was applied to each front foot. Glycerine and tannic acid were applied to the grease-heel.

March 12, 1938.—The walls of the hoofs were again trimmed down so that more frog pressure could be obtained. The necrotic tissues of the frogs was removed and liquor formaldehyde was applied to them. Infected areas about the foot showed up at this time. They were covered with powdered copper sulphate and bandaged, and 20cc of staphlococcus toxoid was given intramuscularly in the neck region.

March 19, 1938.—The frogs were saturated with formalin. The patient at this time showed no lameness on gravel, and the condition and shape of his feet were greatly improved.

March 30, 1938.—The frogs and soles of the feet were thoroughly saturated with formalin. The horse was now capable of service and was used on two mares.

A. V. Schwartz, K.S.C. '38.
Manhattan, Kans.

Drugs Used in Veterinary Medicine

X. INSECTICIDES. Part 1

By VICTOR LEWITUS, New York City

Introduction

THERE is a strong tendency on the part of entomologists and others interested in the welfare of man and other animals to look with much concern into the future. They discern that in the struggle for survival of the fittest, the chances are in favor of insects and their near-relatives. Witness the reports brought home by explorers of the distant jungles of Africa or South America or the Orient, where locusts devastate enormous acreages. Spreading famine, causing sleeplessness and discomfort, and serving as intermediary hosts in the transmittance of disease, these devilish agents have the upper hand in a one-sided affair. Nor is their destructiveness confined to other lands! Only last summer, in the Dust Bowl area, a campaign was initiated to wipe out these same invaders. Twenty thousand men were organized on a military basis and financed by government resources to combat these insignificant-looking enemies. Where they came from no one really knows, for on occasion they have been known to fly, without rest, for hundreds of miles. Perhaps it is because of their fecundity, or merely because they are so versatile in adapting themselves to changes in environment. At any rate, if man is to maintain his present status in the world, and incidentally protect his animal dependents, for his own survival it behooves him to perfect exterminating agents before it is too late. These must needs be effective not only within or on the tissues of the host, but also on organisms infesting plants or soil, and even the atmosphere itself.

The problems that confront the veterinarian in this field are no different. Whether it is a question of treating scabies or pediculosis or mange, one finds common elements with some occasional qualitative differences.

There are numerous, efficient insecticides available. Among these are those of natural as well as of synthetic origin. Several, such as the arsenicals, mercurials, copper and zinc compounds, have already been discussed; and for others, such as the tar and phenol derivatives, coal tar, creosote, etc., lack of space forbids proper discussion at this time. However, four commonly used insecticides will be considered: namely, sulphur, nicotine, pyrethrum and derris root (rotenone).

SULPHUR

History

Sulphur, that waxy, yellow non-metallic element, is one of our most indispensable substances. The date of its discovery is not known, but it must have been familiar to the ancients, for it occurs universally in natural deposits. An early common name, brimstone, is derived from the observation of primitive man that it is combustible. In the Bible it is associated with violent upheavals; and even today some persons associate this element with the devil. The Chinese of old used it in making gun powder; and as early as 2000 B.C. one finds records of its bleaching action on linen, as well as its presence in pigments of the Egyptians. The early Greeks probably first saw in the element its "pest-averting" and disinfectant properties, for in the Odyssey Homer tells us that sulphur was burned to drive out evil spirits. Pliny the Elder is perhaps the one who gave sulphur its deserved place. He studied the stuff obtained in the volcanic regions of Sicily and classified it into various categories such as live sulphur (used in medicine); fuller's sulphur (used in preparing cloth); egula (used in fumigating wool); and sulphur used for causing lamp wicks to burn more readily. He also listed 14 distinct medicinal properties of the element. Because of its universal distribution, and because it possessed some peculiar properties, sulphur led the alchemists to attempt to transmute it into gold. It was not until about the end of the 18th century that the substance was recognized as a definite element. Until then it was be-

lieved to be a mixture or compound. Until the present century, supplies of the golden-yellow element were obtained from the volcanic regions of Sicily and southern Italy. Today, however, the United States ranks first in its production, for Louisiana and Texas contain deep deposits. Ordinarily inaccessible, since the sulphur layers lie from 800 to 1500 feet deep, the Frasch process has made available to us the great bulk of our supply. This invention consists of four concentric pipes sunk to the level of the deposits. With the help of superheated steam (330°F.) and compressed air, the sulphur is melted and forced to the surface in practically pure condition, where it is allowed to crystallize in bins. Once solidified, it is blasted just before shipment.

Preparations

There are three official (U.S.P.) forms of sulphur.

1. *Washed sulphur* (sulfur lotum), which is sulphur washed with ammonia water and dried, is a fine, odorless, tasteless powder, practically insoluble in water and alcohol.

2. *Precipitated sulphur* (sulfur præcipitatum) is made by precipitating a solution of calcium sulphide with hydrochloric acid. It is a pale-yellow, odorless, tasteless powder, practically insoluble in water and alcohol. It is used in 15% sulphur ointment. It is finer and more irritant than the washed type.

3. *Sublimed sulphur* (sulfur sublimatum) is prepared by the sublimation process. It is a fine, yellow powder having a slight sulphur odor and a faintly acid taste, practically insoluble in water and alcohol. It is often referred to as "flowers of sulphur" or "brimstone". It is present in alkaline ointment of sulphur which contains 20% sulphur and 10% potassium carbonate, and in compound sulphur ointment (Wilkinson's ointment), which contains 15% sulphur and 15% juniper tar, in a soft soap base.

Action and Use

Whether it is used internally as a mild purge, or externally, sulphur depends for its action on conversion into hydrogen sulphide or other sulphides which are irritant and antiseptic. In this way it may be used as an antiparasitic application in ointment, lotion or special dip formulæ. For the purpose of fumigation, in the presence of abundant moisture, the element should be burned at the rate of three pounds (1.5 kgm) per 1000 cubic feet of space.

Most authorities consider some form of sulphur preparation invaluable in treating cases of sarcoptic mange. Results in combating other forms of mange, as well as lice and ticks, are usually disappointing. The lime-sulphur dip is useful in small and large animal practice. This dip is made of 12 pounds of unslaked lime (or 16 pounds of commercial hydrated lime) mixed with 24 pounds of flowers of sulphur to 100 gallons of water. Slake the lime in a box or tank, and add water to make a thin paste. Gradually add the sulphur, stirring well until, with the addition of water, a mortar-like consistency is obtained. Now gradually add the mixture to 30 gallons of boiling water, not allowing the water to stop boiling at any time. Boil until the sulphur disappears from the surface. This will take from one and a half to two hours, and during the process mixing should be continuous. Once the mixture assumes a dark amber or chocolate appearance, stop the boiling. Allow to stand in a settling tank or ordinary barrel until all solid matter has settled and the supernatant liquid is clear; then draw off the clear liquid and add enough warm water to make 100 gallons. For dipping purposes, the above concentrate must be diluted by adding 70 gallons of warm water to each 30 gallons of concentrate. This brings the dip down to proper dilutions for practical use. The dry forms of lime-sulphur on the market are not effective in eradicating sarcoptic mange of hogs when scattered in bedding. Milks recommends the use of sulphur and oil of tar (4 oz. each); compound solution of cresol and salicylic acid (1 oz. each); and cotton seed oil (2 pints) for small animals, except cats, in the treatment of sarcoptic mange. For cats, he suggests the use of alkaline and sulphur ointment (N.F.), mentioned above. For eczema and ringworm, a white lotion of "Liver of sulphur" (po-

tassa sulfurata) solution combined with zinc sulphate solution (both solutions saturated and mixed until frothing and a thick white paste results) have been suggested recently. A new organic sulphur remedy known as "odylen" has been recommended recently for large and small animals. It is a golden-yellow, clear liquid, which forms yellow crystals in the cold, and redissolves on warming. It has been proved non-toxic when used externally on animals. It is indicated for all types of mange (especially follicular), herpes tonsurans, favus, eczema, otitis externa, mallenders, scaly leg in poultry, lice, and fleas. It should be rubbed into the skin with a rag or brush. Keep it from the eyes, and do not bathe the patient during the course of treatment.

NICOTINE

History

The history of nicotine is the history of tobacco. We know that the plant (*Nicotiana tabacum*) and its closely related species were originally native to tropical America, for historical accounts mention the introduction of the "weed" into Europe some time after Columbus discovered America. In 1828 Posselt and Reimann isolated the active principle, nicotine, from the plant. The constituent gets its name from Jean Nicot, the French ambassador to Lisbon, who is reputed to have sent some of the tobacco to Catherine di Medici to cure her headache in 1560. It happened that the lady was so pleased with it that instead of using it as a poultice (as prescribed) she smoked it (and probably was the forerunner of our female smokers of today!). The herb then became known as the "sovereign weed" or "Queen's herb". Nicotine is a liquid alkaloid, having the formula $C_{10}H_{14}N_2$. The percentage present in the tobacco plant varies considerably, ranging anywhere from 1% to as much as 9%. As a general rule a hot, moist climate and very rich soil tend to increase the percentage. DeToni found that the active principle was confined mainly to the epidermis, and especially at the base of the trichomes (plant hairs) which occur on the plant. It seems not to occur in appreciable amounts in the young plant or in the seeds, but most other parts contain it. Careless drying of the plant causes enormous losses. In Havana tobacco one finds from 1 to 3%; in Virginia or Kentucky grades, about 7%; in Syrian crops, from 1 to 2%; and in French and Algerian grades, as much as 9%. Nicotine occurs as a complex salt. It takes the form of a citrate or malate in the plant and is readily soluble in water. The pure alkaloid may be easily obtained by treatment with alkalies, such as caustic potash. The principle is a colorless, volatile liquid, having a pungent, acrid, tobacco-like odor and a burning taste. Upon exposure to air it may turn brown and assume a resinous consistency. Nicotine is soluble in alcohol and ether, and is decomposed by heat.

Preparations

Nicotine itself has been used in diluted solutions, but today it is mostly used in the form of nicotine sulphate. This drug is used both externally and internally in veterinary medicine as a dusting powder, in capsules, in tablets and in solutions.

Applications

In poultry husbandry, nicotine has been found useful in ridding animals of lice and worms. To rid the flock of lice, nicotine sulphate is applied with a brush to the surface of the roosts about a half hour before the fowls go to roost. The fumes pass upward through the feathers, suffocating the lice. This forces them to the surface, where they drop off and die. Most of the lice are killed the first night, although some will not be affected until the second or third evening. The nits, or eggs, are not at all affected, and for this reason a follow-up treatment in about 10 days is necessary to destroy newly-hatched lice. The body louse, shaft louse and fluff louse can thus be eradicated from an entire flock after two or three applications, provided all birds are made to roost on the treated perches. There is some possibility that head and wing lice may escape, so that this method is not absolutely effective. The rapid action and the fact that the individual fowl need not be handled, recommend this as a practical measure for poultry fanciers. Proper ventilation should, of course, be provided dur-

ing the treatment. The best time for application is a warm summer night when the air is rather still, since wind carries away the fumes and renders treatment useless. One pint of nicotine sulphate ("black-leaf 40") is sufficient to paint from 150 to 200 feet of perches.

Internally, nicotine sulphate has been used successfully in the treatment of roundworms (*Ascaridia lineata*) and tape worms of chickens, turkeys and game birds. Some of the formulæ consist mainly of tobacco dust to be mixed in the food; others of tablets or capsules containing nicotine and kamala, with some purgative. Quortrup recommends as a flock treatment for game birds tobacco dust used in the mash in the proportion of 2% to 4%. The dust should contain from 1½% to 2% nicotine. Too much of the mixture should not be prepared at one time, as the nicotine loses strength on long exposure. The feeding of this mash should continue for two to three weeks, be stopped for a time and then continued. When fed regularly, tobacco dust does not seem to be as effective as when fed occasionally. During the period of administration of worm remedies, it is important to remove the litter and droppings frequently.

Typical Poultry and Turkey Worm Formulae:
(Tape- and Roundworms)

A.

Nicotine sulphate	1/15 grain	(.005 grams)
Extract kamala	5 grains	(.325 ")
Phenolphthalein	½ grain	(.033 ")
Absorptive agent	2 grains	

The absorptive agent, together with the enteric coating, renders the drugs unavailable until after they have passed the crop, stomach and gizzard, when they become active in the intestines. Turkeys less than three months of age should not be treated. In animals up to 10 pounds, one such dose is recommended. Between 10 and 12 pounds, two such doses are given.

B.

(For Chicks)

Kamala U.S.P.	5 grains	(.325 grams)
Nicotine sulphate	1/5 grain	
Calomel	1/5 grain	

(For adults)

Kamala U.S.P.	12 grains
Nicotine sulphate	½ grain
Calomel	½ grain

A rather recent use for nicotine sulphate is as a spray for keeping dogs and cats off flower beds and shrubbery. When sprayed on the premises or directly on the plants, this substance has been found very efficient in discouraging animals, since dogs and cats find the odor of nicotine very obnoxious, even in great dilutions. Since the drug is volatile, the garden plants will need to be sprayed from time to time (about every two weeks), especially after a heavy rain. Livestock must be kept from grazing on vegetation so treated. Incidentally, a tablespoonful of 40% nicotine sulphate to a quart of strong soapsuds is efficacious in ridding the premises of ants. The free alkali in the soap activates the effects of the nicotine sulphate.

For sheep and goats, nicotine is most useful both as a dip and as internal medication in ridding the animals of parasites. Nicotine dips are well known for their effectiveness in eradicating sheep ticks, as well as scabies and lice. For such purposes, a well-diluted nicotine solution (0.07%) is recommended, since stronger preparations may injure the animals. The dip may be used warm or cold, but should not be heated above 110°F. For ticks, dipping should occur at intervals of 24 to 28 days. For lice, this same solution often combined with 2% flowers of sulphur is effective. It is usually necessary to dip at least twice, at 14 to 16-day intervals, in order to reach the lice hatched since the previous dipping. The animals should be carefully handled, and the bucks, ewes and lambs dipped separately. The sheep should be fed and watered from 3 to 6 hours before dipping to avoid thirst and hunger. In hot weather, the animals should be allowed to cool off beforehand; in cold weather the dipping should be early enough to allow proper drying. It is best to wait at least ten days after shearing before dipping.

For internal parasites, such as stomach worms and tapeworms of sheep, either the nicotine sulphate solution alone or the combination of copper sulphate-nicotine sulphate solutions is most effective. Critical tests, according to Rietz, have shown that the 1½% copper sulphate and the 1½% nicotine sulphate solutions are best. Briefly, the directions for drenching are: Prepare the solution by dissolving one ounce of copper sulphate and one ounce of 40% nicotine

sulphate in three quarts of soft water. Dose as follows:

For lambs 40 to 75 pounds	1½ to 2 oz.
For sheep 75 to 100 "	2 to 3 oz.
For 100 pounds and over	3 to 4 oz.

The animals should be kept off feed and water for 12 to 18 hours before and 6 hours after drenching. The dose should be carefully gauged with the help of a syringe and graduated plunger. The solution must at all times be well agitated, since otherwise the non-uniform mixture may have toxic effects. Initially, only the distinct blue shining crystals should be employed, since the dry, whitish copper sulphate is not constant in composition and also produces stronger solutions. Avoid metallic containers, but use glass or earthenware containers for mixing, to avoid corrosion and toxic products. Treatment should be repeated at intervals of not more than 21 days. The sheep should always be kept standing, and the head should not be raised more than necessary, to avoid strangulation.

For horses and cattle, nicotine dips are efficacious in ridding them of lice and mange, or scab. The solutions should be well diluted, so that they contain not more nor less than 0.05% nicotine. If increased strengths are employed, especially when animals are hot, they may do great harm. Preparations on the market which do not state the strength of the nicotine content should be avoided. These dips may be used warm, but should not exceed 110°F. For scab, the dip should be maintained at 95 to 100°F. Sulphur is beneficial when suspended in the nicotine solution at the rate of 16 pounds (of the flowers) to 100 gallons of the diluted nicotine dip. This substance, though mostly insoluble, becomes lodged on the skin of the animals and remains for long periods.

Toxicology of Nicotine

Nicotine is one of the most powerful poisons; in fact, it is comparable in potency to hydrocyanic acid. It acts swiftly when taken by the animal in sufficiently large doses, causing local irritation and great pain in the throat and stomach, muscular weakness and tremors often causing prostration, severe convulsions (both tonic and clonic), followed by great depression. Some animals will vomit and also purge and urinate involuntarily. The respiration early becomes threatened, and the circulation finally becomes involved in the general collapse. Treatment, as early as possible, consists of evacuation of the stomach, use of tannic acid as a chemical antidote, strychnine or atropine or caffeine as general or cardiac stimulants, as well as external heat and artificial respiration. In some cases as little as one drop of nicotine for dogs and five drops for horses has proven fatal. In experimental animals, intracardiac injections of epinephrine and indirect cardiac massage have been successful, even when there was complete muscular paralysis, and failure of circulation and respiration.

This is the tenth of a new series of 12 articles by Professor Lewitus on drugs used by veterinarians. The eleventh article, INSECTICIDES, PART II, will appear in an early issue.—EDITOR.

Leucemia of Canaries

(*Concluded from page 389*)

should be done to clarify the nature and cause of the disease in canaries.

Since canaries hatch their young in 14 days and fully-feathered birds are produced in about the same time, more rapid progress in the knowledge of leucemia of fowls may be made by the utilization of these birds in this research, as the pathological picture of leucosis in canaries is apparently the same as in chickens.

Not all the pathological changes observed in chickens have been found in canaries examined thus far, but probably when a large number affected with leucemia have been autopsied some or all of these lesions may be observed. Needless to say, the discovery should be of great importance to the canary industry itself. Investigations at this station will be continued and more extensive studies made of the nature and course of this disease in canaries.

Genetics via Radio

"'Twenty-Grand' is sterile. Every time he has been bred to a mare the foal has been born dead."—Al Cummins.—Managing Editor, The Daily Racing Form.

Canine Pediatrics

IV. Specificity and Compatibility of Proteins in Puppy Nutrition*

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PROTEINS are a basic stuff of life. They frequently are called the building stones of living cell structures. In combination with other substances they form the protoplasm of virtually all plant and animal tissue.

Recent investigations have produced evidence that antigenic protein molecules may be identified as the so-called filterable viruses which long have baffled bacteriologists. Further study into possible relationships between protein entities such as the enzymes, the viruses, prosthetic symplexes and nutritive attributes of various food proteins may throw new light on the physicochemical flux of life processes.

A comprehensive and significant preview of the potentialities which the physical approach to biological phenomena holds for the future is evident in the concepts developed and pioneered by Theo. Svedberg, which show that upon the application of centrifugal force many proteinaceous materials, heretofore considered as entities, are in reality separable into a number of individual components. This observation would be of only casual or academic interest were it not for the fact that the characters of such separable components of various proteins are subject to change as a result of casual physical treatment such as exposure to light, exposure to temperature fluctuations, agitation, concentration, and even the element of time without further introduction of variation in treatment, and, in the case of blood proteins, change during or after disease. These phenomena, heretofore unsuspected by the physiologist or chemist, conceivably may afford a working plan for advancement of medical science and physiological and nutritional research in the not distant future.

These findings and the obvious principles to be deduced from recorded observations clearly lead to the conclusion that biological matter, and more especially the proteins as they exist in natural products, represent delicate balances or specific states of dispersion, highly labile and unstable in their intimate characteristics once their equilibrium is disturbed. Probably one of the most pertinent illustrations applicable to the fundamental mechanics of nutrition is the variation in diffusibility of protein matter through colloidal membranes, analogous to the semipermeable membrane of the walls of the individual cells, which has been shown to occur with certain protein components isolated from milk after mild physical treatment of such proteins.

It has been possible to isolate from milk a proteinaceous material, colloidal in nature and intimately associated with cholesterol and traces of phospholipins, which, when freshly prepared, was non-dialyzable through a semipermeable dialyzing membrane. The same material, however, after variable storage periods at different temperatures, exposure to body temperature, exposure to light, and mild agitation, became completely diffusible or diffusible to a degree commensurate with the degree to which these various influences altered its original character. Undoubtedly these observations are of significance as abstract illustrations of the phenomena concerned in nutrition and absorption of nutritive substances by the individual cell. The potential positive or negative nutritive value of any specific protein, when ingested by the young of a particular species, therefore, becomes a matter of primary importance involving not only the generic characteristics of the

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particular protein in providing essential amino acids, but also the exact nature of the protein and its particular pattern of dispersion which, according to the illustration cited, first may be reflected in the rudimentary matter of diffusibility or non-diffusibility through the cell wall of the absorptive tissues.

The necessity of providing the amino acids essential for tissue building is a concept of nutrition now well established, and the epochal researches of the early 1900's which disclosed that the marked variations in nutritive character of proteins depend upon their inherent amino acid content served as the incentive for further elaboration of similar studies.

RESULTS of such investigations may be summarized briefly by stating that the complex structures of different proteins embody variations in the amounts and proportions of the essential amino acids. Various proteins of animal origin differ in this regard and there is even wider differentiation in the proteins of animal and vegetable origin. These differences now are demonstrable to a degree by analytical means, although such analytical evidence reveals little or nothing of the significance of the more subtle and complex nature of protein characteristics on the one hand and the ability of an animal, especially the very young, on the other, to utilize specific protein material efficiently and without manifestation of adverse effects.

The metabolism and protein requirements of the new-born puppy differ from the metabolism and protein needs of the calf. Since the milks of the two species are designed to meet the requirements of their respective young it is not surprising that the protein system of cow's milk is quite different from the protein system of bitch's milk, as to both proportions and physico-chemical status.

Cow's milk has too much of some proteins and too little of others to match the puppy's needs. Certain of the proteins as they occur in cow's milk are incompatible to the puppy. The puppy's system is able, to a limited extent, to assimilate some of these cow's milk proteins and convert them to its own requirements, but clinical feeding tests have demonstrated that this capacity for adaptation is not extensive enough to enable pups to thrive on cow's milk.

FORTUNATELY for puppies that must be fed artificially, means have been developed to suppress inter-species incompatibilities discussed previously in these articles, and to bring the proteins within the range of the puppies' utilization abilities.

The usual classification of the proteins of milk includes casein, lactalbumin, lactoglobulins, and subvarieties of the latter two. The biological differences between the proteins of one milk and corresponding proteins of the milk of a different species are well illustrated by a consideration of the globulins. The globulin of a milk, alone of all the milk proteins, is more nearly analogous to the blood protein of the species. Further, the most striking difference between colostrum and milk is the very high globulin content of the colostrum.

PARTURITION is a nutritive crisis for the young. It represents a transition and adaptation from the mode of existence of intrauterine growth, to a less friendly extrauterine existence with the placental source of nourishment forever severed. It is apparent that the colostrum or first lacteal secretion must comprise substances which by nature are designed to cushion the nutritive shock of parturition and to continue without interruption the normal development of the puppy, confronted for the first time with the objective necessity of active feeding.

Certain families among the mammals effect much of this transitional preparation during the placental phase. Human infants arrive in the world well prepared for adaptation to extrauterine existence. Successful artificial feeding of babies has demonstrated the soundness of this view. The new-born of the ruminants, on the other hand, are almost entirely dependent upon colostrum to establish them on a course of normal nutrition. The canine species falls midway between these two. The puppy is

not fully endowed with a capacity to utilize or adapt, easily, to his needs a wide variety of proteins.

Thus, in determining an artificial food for new-born puppies it is imperative that the proteins selected, as well as their specific properties, fall within the limits of toleration set by the characteristics of the species. Proper choice of proteins for a specific nutritive purpose can be made only in the light of certain physicochemical phenomena which are not even suggested in gross analytical study, but which are of preëminent nutritive significance as reflected in biological results.

THUS, although from the point of view of chemical analysis casein is casein, the casein of cow's milk is not the casein of bitch's milk because of marked physicochemical differences; indeed, the casein of cow's milk is not the entity it long was thought to be. Sedimentation of milk serum in the ultracentrifuge reveals that there are a number of separate caseins, each with its own particle weight. A total given mass of casein material may be relatively stable under certain conditions or it may be unstable under other circumstances.

Every possible arrangement of the casein proteins implies a biological significance, just as different combinations of cards in a bridge hand determine bidding and trick-taking possibilities and limitations.

There is good evidence that some differences in biological properties of milk proteins are due, not only to the particular character of the protein itself, chemically considered, and its state of dispersion, but also to the character of the substances physically adsorbed or associated with it. The term "denatured" protein is familiar in scientific and medical literature and no doubt conveys different meanings to different individuals. The denaturing of a protein suitable for one species may be the very circumstance which would eliminate toxicity of the same protein for another species. The exact mechanism of this denaturing process or the particular courses it might take, depend obviously upon the individual characteristics of the protein and the conditions which hold a dispersed protein in a given state of equilibrium. Broadly speaking, it might be stated that any denatured protein is one which exists in any other state than the equilibrated state of suspension or dispersion as found at its natural source.

These considerations, substantiated by considerable improvement in methods of study and broadening of scientific concepts within recent years, provide a basis for the manipulation and alteration of specified proteins whereby, with appropriate principles as a guiding theme, the flexibility and latitude in the preparation of simulated milks for different species are considerably broadened.

THE physical status of a given protein system often determines the existence and nature of certain molecular relationships known as symplexes. A symplex may be defined as the association of a biologically active component with a colloid of higher molecular weight, the biological properties of which are different from those predictable from the properties of its components individually considered. The characteristic nutritive and biological properties of a symplex may be altered by changing the physical and chemical relationship between the components.

These combinations of proteins with other factors, in the form of symplexes, are prosthetic relationships, which is another way of saying that they represent a working assembly of their constituent parts rather than a mere quantitative assortment of the same constituents not functionally articulated.

The significance of such symplexes and a recognition of the biological potentialities of prosthetic combinations are of vital importance in the formulation of a simulated bitch's milk for artificial feeding of very young puppies, particularly in connection with the protein selection.

Biological tests in the Borden Research Laboratories have demonstrated that formulas which match the gross quantitative composition of protein in natural bitch's milk fail to meet the dietary requirements

of very young puppies unless the protein has been changed to conform more nearly to the particular properties of the protein of bitch's milk.

The biological significance and implications of these interrelationships of toxicity, toleration, immunity, multiple nature of specific proteins, prosthetic combinations

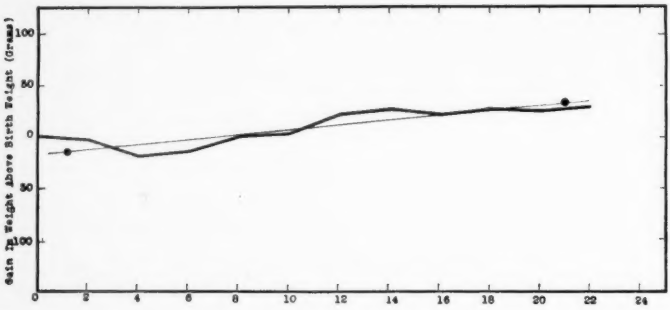

CHART VI

The minimal growth rate of the puppy whose history is recorded in this graph demonstrates the unsatisfactory results obtained from cow's milk with carbohydrate-fat-protein ratios and the character of the protein component not modified to meet the requirements of young puppies.

Favorable protein combinations and states of the proteins are partially dependent upon varying degrees of dispersions of the proteins concerned. The degree of dispersion of a substance is, roughly, its degree of molecular porosity. The specific molecular pattern of a protein in a particular state of dispersion also determines, to a degree, what other substances with their characteristic molecular patterns will fit into a compatible combination in somewhat the same manner that the cogs of a gear or the thread of a bolt limit and define their mechanical complements. If the tumblers in a lock are changed the key no longer fits.

and degrees of dispersion are almost infinite, but each must be recognized and considered in the complex problem of synthesizing bitch's milk through modification of the original pattern of available proteins to conform to the pattern of the proteins of bitch's milk.

NECESSARILY, this discussion has dwelt extensively upon certain abstract aspects of proteins in nutrition. The abstract discussion, however, is not predicated solely upon theory. Concrete results in terms of actual demonstration of the principles outlined in the feeding of very

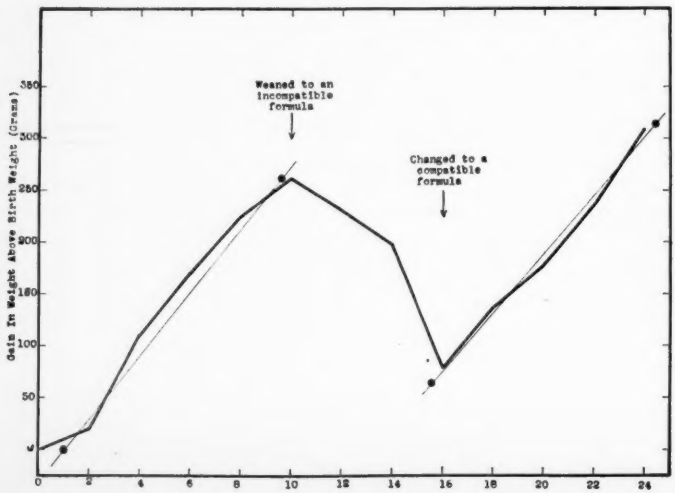

CHART VII

This graph shows that for 10 days the puppy thrived on its mother's milk, but lost weight during the six days it received an artificial formula which approximated the natural carbohydrate - fat - protein ratios of bitch's milk but in which the protein component was incompatible. Substitution of a more compatible protein component, with no alteration in ratios, brought the quick growth response shown in the increment after the sixteenth day.

young pups are illustrated in charts VI to IX.

Reference was made in a previous article in this series to the necessity for considering the ratios of components of various milks in simulating the milk of a particular species. Correct ratios alone, however, are of only elementary value. Chart VI shows the growth response of a very young pup taken immediately from its mother at birth and given a cow's milk modified only by fortification with the fat and water-soluble vitamins but without qualitative modification or quantitative change in ratios of the gross components, fat, protein and carbohydrate, inherent in the cow's milk. The graph shows that this puppy received just about maintenance requirements. Failure to grow and thrive is obvious. The animal died within a few days after the 22-day observation period. The negative character of this response is obvious.

Chart VII shows the growth response of a puppy subjected to the following dietary regimen:

For the first ten days the puppy received its mother's milk and thrived. The ratios of constituents in the mother's milk were carbohydrate to protein 0.39 to 1, carbohydrate to fat 0.34 to 1, fat to protein 1.13 to 1. On the tenth day the puppy was given an artificial formula in which the various ratios more nearly simulated that of the bitch's milk than would cow's milk. The ratios were carbohydrate to protein 0.59 to 1, carbohydrate to fat 0.99 to 1, fat to protein 0.59 to 1. Notwithstanding the closer approximation to the ratios of bitch's milk, this experimental product acted essentially as a violent poison to the puppy as indicated by the immediate decline in weight.

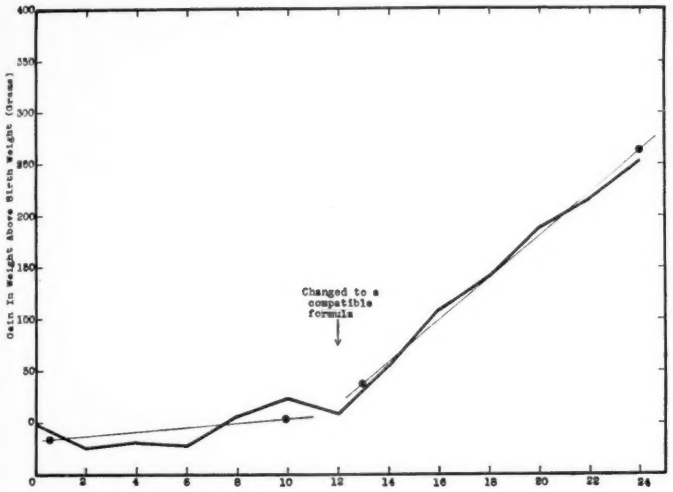

CHART VIII

How a puppy reacts to artificial feeding formulas of substantially similar carbohydrate - fat - protein ratios, but markedly different specific protein characteristics is illustrated by the slow progress during the first twelve days while the puppy received protein of mediocre compatibility and the contrasting favorable growth increment thereafter when a more compatible protein constitutent had been substituted.

On the sixteenth day and thereafter the puppy was fed a new formula differing essentially from the previous formula in the character of its protein and related components, but not substantially different as to ratios of components from either bitch's milk or the previous formula which proved highly toxic. The ratios of the new formula were carbohydrate to protein 0.55 to 1, carbohydrate to fat 0.84 to 1, fat to protein 0.65 to 1. The immediate favorable response to the animal to the new formula illustrates graphically the diametrically opposite results which may be obtained by suitable selection and use of protein in the compounding of simulated bitch's milk.

Chart VIII records the response of an animal to two formulas of different degrees of compatibility. In both formulas the ratios of major components were substantially

the same as those of the formula fed to the puppy of Chart VII during the period of declining weight and marked evidence of toxicity. The character of the protein component fed to the puppy whose history is recorded in Chart VIII, however, was quite different. Although toxic reactions were not manifested from the protein of the first of the two formulas, it is evident that the puppy failed to grow satisfactorily. On the twelfth day a new experimental formula, with protein of substantially different inherent character, which was highly compatible, was fed. The immediate and sustained growth response is indicated by the statistical graph and the daily weight curves in the second increment of Chart VIII.

The case history recorded in Chart IX typifies a practically ideal transition from natural to simulated bitch's milk without significant interruption in the progress and growth of the animal from the time of birth. During the first 10-day period this puppy received its mother's milk. At the tenth day the puppy was given a satisfactory simulated bitch's milk with the ratios of components not markedly different from those of the formulas used in the feedings recorded in Charts VI and VII. In this instance, however, the compatibility of the protein was suited more ideally to the needs of the puppy and conformed more closely to the protein of natural bitch's milk than did the proteins in those formulas which proved unsatisfactory. The favorable character of this particular simulated bitch's milk formula, and the consequent favorable response of puppies fed on it, were the result of appropriate selection of compatible components of the dietary, particularly the proteins.

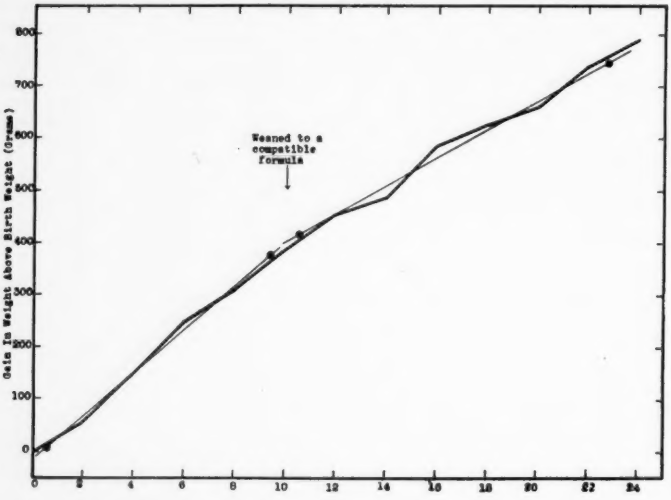

CHART IX

The uninterrupted growth of a puppy weaned from its mother's milk at ten days to a simulated bitch's milk of highly compatible protein constituents, as well as suitable ratios of components, is recorded in the daily curves and the almost continuous statistical slopes of this graph.

ALTHOUGH the veterinarian, in the practice of canine pediatrics, will not be called upon to determine the degree of dispersion of any milk protein, an understanding of the underlying biological principles—as outlined and illustrated in this discussion—that determine the adequacy or the inadequacy of a protein system in the nutrition of puppies will reinforce him with an authoritative criterion by which he may guide his clients away from disastrous errors in feeding very young puppies.

Sheep Pox (Scabby Mouth) Ointment

Detach the scabs and swab the raw surfaces with a 5% solution of copper sulphate, then apply an ointment made up as follows:

℞ Coaltar dip	5.
Sublimed sulphur	10.
Tallow	100.

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Abstracts

Fractures in Horses

The os carpi accessorium becomes fractured usually during a fall, in which case it is apt to be caught in the angle of flexure of the knee.[66] The mechanism which causes this fracture is similar to the action of a nut cracker. The line of fracture is usually in the anterior third of the bone or along the transition from the anterior to the middle third. Fissures and partial fractures heal, as a rule, in three to four months. In total fractures functional healing takes place by means of formation of a pseudo-arthrosis. Therapy consists in removing the shoes, transfer of the horse to a box stall with soft bedding, application of antiphlogistine, regulation of the diet. Three to four weeks later the knee is blistered, or puncture fired. In about six to eight months the horse should be able to perform work again.

Permeability of the Mediastina of Domestic Animals

The mediastinum of the horse, dog, and cat, according to the teachings of several anatomists, forms a delicate membrane in its ventral, and especially caudal part, possessing numerous openings.[64] The checking of this statement on 146 dogs, 73 cats, 16 horses, 1 ass, 4 cattle, 16 sheep, 3 goats, 10 hogs, and 21 rabbits resulted in the following observations: In young, immature dogs the mediastinum is impermeable for gases, fluids, and bacteria. Consequently, pleuritis and pneumothorax remain unilateral, provided they originate in one pleural sac etiologically. In mature dogs, however, which have not suffered from a productive inflammation of the mediastinum, this tissue is permeable for gases, fluids, and bacteria. In such dogs pneumothorax is always, and pleuritis in the large majority of cases, bilateral. In certain cases of pleuritis inflammatory deposits upon the mediastinum occur early, preventing a spread of the process to the other pleural cavity. An identical observation was made on cats. In horses which previously had not suffered from a productive inflammation of the mediastinum, this latter tissue is permeable to gases, fluids, and bacteria. Thus pneumothorax and pleuritis, etiologically originating in one pleural cavity, spread through the mediastinum into the other pleural cavity. In the remaining domestic animals examined the mediastinum forms a solid membrane, impermeable to gases, fluids, or bacteria.

[66] Pape, J., 1937. Fracture of the os carpi accessorium (Trans. title). *Berliner Tierarztl Wochschr.* 53:81-86.

[64] Rapic, S., 1937. The permeability of the mediastinum for gases, fluids, and bacteria in domestic mammals. (Trans. title). *Vet. Arh.* 7:581-595.

Oxytocic Action of Lentin and Hypophysin

Experiments carried out by Horvath[78] demonstrated that the non-pregnant equine uterus produces automatic rhythmic movements. The administration of hypophysis preparations increases the automatic contractions of the uterus; in cases of uterine inertia it causes contraction. The administration of lentin, likewise, increases the contraction of the uterus and in case of uterine inertia stimulates contraction. The action of lentin is shorter than that of the hypophysis preparation.

The gravid uterus responds very slowly and irregularly to stimulation with hypophysis preparations. In order to produce a rise in tonus a fairly high dosage of the preparation has to be given.

Technique of X-Ray Examination

In a collision with an automobile a three-months-old colt suffered a wound in the region of the fetlock. Thirty-three days later the horse was presented to the Leningrad Veterinary College.[81] A roentgen ray exposure was made to determine whether a fissure or a partial fracture was present. The roentgen photograph, taken without contrast injection of air, did not reveal any clues. Air was then injected into the joint capsule and a second exposure taken. The

[78] Horvath, E., 1938. The influence of Lentin and of Hypophysis Extracts upon the Uterus of the Mare. (Transl. title) *Wien. Tierär. Mntsch.*, 24:138-143.

[81] Wischnjakoff, A. I., and W. A. Nikanoroff, 1938. The Roentgenray Photography of the Ligamentous and Tendinous Apparatus of the Horse. (Transl. title) *Wien. Tierär. Mntsch.*, 24:263-267.

latter picture disclosed a sharply circumscribed spot, indicating the presence of a substance (connective tissue) permeable to the air. Diagnosis: fibro-purulent arthritis.

Another horse was presented with the history that it went lame from an unknown cause four days previously. Clinical examination revealed fever, pronounced claudication, and pain upon passive movement in the digital joints. For diagnostic purposes air was injected into the joint capsule, and a roentgen ray exposure taken. The x-ray picture disclosed a dark shadow dorsally in the lower part of the joint capsule. The contours of the shadow were straight and horizontal; above it was a distinct zone of clearing. Diagnosis: purulent arthritis. Exploratory puncture confirmed the diagnosis.

Treatment of Infection in Foals

In a large number of colts observed over a period of more than 10 years, Hillerbrand[65] had occasion to test out all kinds of remedies. So far, the best treatment proved to be that with serum from the dam's blood, alternating with Yatren-Casein injections. Recently, however, the author used a chemotherapeutic agent, called prontosil. The results were surprisingly better than with the former treatment. The procedure of treatment was as follows:

Three times daily the colt received a powdered prontosil tablet formed into a pill with butter. Severely affected colts received two tablets in the evening. On the first day of treatment the colt received an additional dose of 5cc prontosil solution intravenously. Then 500cc of blood was drawn from the mother. On the next day 400 to 500cc of serum was slowly injected intravenously. On the first day the colt was also bled by drawing 180 to 250cc blood. The following day, previous to the serum injection, additional 50 to 100cc of blood was drawn. From then on, until the fever subsided, 5cc prontosil was injected daily intravenously. In recidive cases, the injection of serum from the dam was repeated.

[65] Hillerbrand, N. Therapy of pyosepticemia of colts (Trans. title). *Münchener Tierarztl Wohnschr.* 87(23) :267.

Brucella Agglutination in Horses

Leskova[79] did not find the whole blood, rapid agglutination test a dependable means of diagnosing *Brucella abortus* agglutinins in the blood of horses. The Huddleson's rapid agglutination test, however, has given practical results, comparable in accuracy to those of the tube agglutination test.

Of 1100 horses tested, 407 reacted positively to the serum, rapid agglutination test. When retested with the tube agglutination method, 120 reacted with a titer of 1:100 and over. Of 185 horses suffering from various surgical ailments, 107 reacted positively to the serum, rapid agglutination test; when tested by the tube agglutination method, 44 gave a titer of 1:100 or over. The percentage of positive *Brucella abortus* agglutinations rises with the age of the animal. Mares exhibit a higher percentage of reaction than geldings. Fewer positive agglutinations are encountered in city than in country horses. The author is of the opinion that a titer of 1:100 is indicative of actual *Brucella abortus* infection.

The Diagnosis of Gastrophilus Infestation

Natscheff[80] observed that the larvae of *Gastrophilus nasalis* cause merely mechanical damage to the tissues. Moderate invasions by larvae of *Gastrophilus inermis* usually do not produce any symptoms. The finding of Gastrophilus larvae in the rectum is considered of diagnostic importance in so far as it indicates that larvae must also be present in the stomach and duodenum. The ophthalmic test recommended by Van Es and Schalk proved to be without value. For expelling the larvae from the stomach and duodenum, carbon disulphide has given best results. Those located in the rectum are best removed by mechanical dislodgement. From a prophylactic point of view the destruction of fly eggs and systematic worming with carbon disulphide are important sanitary measures.

[79] Leskova, R., 1938. Brucella Abortus Bang Agglutination in Horses. (Transl. title) *Wien. Tierär. Mntsch.*, 24:225-233.

[80] Natscheff, B., 1938. Equine Gastrophiliasis. (Transl. title) *Tierär. Rund.*, 44:85-88.